Common Defects and Structural Problems in the Buildings of Northern Cyprus, their Reasons and Prevailing Applicable Solutions

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ABSTRACT

In the recent years, building sector grows rapidly parallel to the human needs. Sometimes these quick productions cause several types of problems on the buildings. These problems occur in varying intensities depending on the type, location, environment, materials and the construction conditions of the building. Problems and failures in buildings can be broadly attributed to either defects, deteriorations or structural problems. Mostly, these defects or structural problems arise due to error or omission that is breach of contract or negligence by designer, contractor, or user. In general, lack of care and knowledge in specification or workmanship are the main reasons of various defects and structural problems. On the other hand, deterioration is natural process, which may be unavoidable, although minimized by care in design and the selection of materials. Cracks, efflorescence, peeling on painting, mouldiness, rising dampness, soft storey, short column, shear cracks, compression cracks, irregularities in plan, irregularities in elevation and etc. are some of the most significant problems that occur in building of Northern Cyprus.

These defects, deteriorations and structural problems have negative effects both on human and building lives. They mostly harm to the health and economy. Besides, they reduce the aesthetic quality. On this basis, the aim of the study is to discuss these prevailing defects and structural problems with their reasons which occur in North Cyprus. It is also expected to present the most common precautions and available applied methods for preventing or reducing these problems.

Work to be carried out:

1. General search about the building defects and structural problems and categorization.

2. According to the first step (researches), the most common precautions and available applied methods for preventing or reducing these defects and structural problems were investigated and presented.

3. Case studies in different districts of North Cyprus were visited and the collected data were analysed and compared. There are a total of 125 case studies in this thesis divided into two samples. The first sample represents completed buildings contains 100 case studies consisting of 25 case studies for each of the four following districts: Mağusa, İskele, Lefkoşa and Girne. This sample is aimed for the study of reinforced concrete defects and non-structural defects. The second sample represents buildings under construction contains 25 case studies. This sample is aimed for the study of seismic design faults.

Keywords: Building Defects, Deteriorations, Structural Problems, Seismic Design, Northern Cyprus.

ÖZ

Son yıllarda, inşaat sektörü insanların ihtiyaçlarına paralel olarak hızla büyümektedir. Bazen bu hızlı büyüme, binalarda çeşitli sorunlara sebep olmaktadır. Bu sorunlar, binanın tipi, konumu, kullanılan malzeme, çevre koşulları ve binanın yapım şartlarına bağlı olarak değişen seviyelerde meydana gelmektedir. Binalardaki problemler, kusurlara, bozulmalara ve/veya yapısal sorunlara dayanır. Çoğunlukla, bu kusurlar ve yapısal sorunlar tasarımcının, yüklenicinin ve/veya kullanıcının ihmali nedeniyle ortaya çıkar. Genel olarak, ihmal, şartnamelerle ilgili bilgi eksikliği veya işçilik problemleri binalardaki kusurlar ve yapısal sorunların ana nedenleridir. Öte yandan, binalardaki problemler, tasarım, periyodik bakım ve doğru malzeme seçimi ile minimize edilse de doğası gereği tamamen engellenemeyebilir. Çatlaklar, çiçeklenme, boyada soyulma, küf, zeminden yükselen nem, yumuşak kat, kısa kolon, kesme kuvveti çatlakları, basınç çatlakları, planda düzensizlik durumları, düşey doğrultuda düzensizlik durumları gibi sorunlar Kuzey Kıbrıs'ta bulunan binalarda meydana gelen en önemli sorunlar arasında yer almaktadır.

Bu kusurların, bozulmaların ve yapısal problemlerin insan sağlığı ve binaların ömrü üzerinde olumsuz etkileri vardır. Çoğunlukla da sağlık ve ekonomiye zarar vermektedirler. Bunun yanında, binalardaki estetik kalitesini de düşürmektedirler. Bu temele dayanarak, çalışmanın amacı Kuzey Kıbrıs'taki yapılarda meydana gelen bu problemleri ve sebeplerini ortaya koymaktır. Buna ek olarak seçilen vaka incelemeleriyle, bu problemlerin önlenmesi veya azaltılmasına yönelik çözüm önerileri ve metotlarını sunmaktır.

Gerçekleştirilecek çalışmada:

1. Bina kusurları, yapısal sorunlar ve bunların sebepleri ile ilgili detaylı bilgi verilmesi.

2. İlk adımda yapılan araştırmalar ışığında, bina problemlerinin önlenmesi veya azaltılması için gerekli çözüm önerileri ve metotlarını araştırmak ve sunmak.

3. Kuzey Kıbrıs'ın farklı şehirlerindeki (Mağusa, İskele, Lefkoşa ve Girne) yapılardan örnekler seçilerek incelenmesi ve toplanan verilerin analiz edilmesi ve karşılaştırılması.

Bu tez kapsamında toplam 125 örnek vaka incelenmiştir. İlk 100 vaka çalışmasında her şehirden (Mağusa, İskele, Lefkoşa ve Girne) 25 bina seçilerek betonarme kusurları ve yapısal olmayan problemler incelenmiştir. Geriye kalan 25 bina yine bu şehirlerden ve yapım aşamasındaki binalardan seçilerek sismik tasarım hataları incelenmiştir.

Anahtar Kelimeler: Bina kusurları, bozulmalar, yapısal sorunlar, sismik tasarım, Kuzey Kıbrıs.

This thesis is dedicated To My Parents

for sponsoring my education financially

And To Humanity

wishing for peace, tolerance and better future for the world through science

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INTRODUCTION

1.1 General

Since the dawn of mankind, humans lived in various types of homes. Buildings are very important for sustaining life. Defected buildings can cause problems to its occupants. In earthquake regions these problems may result in injuries or even worst; death. It is a natural desire wanting to be safe in our homes.

There are several types of structural systems, construction methods and building materials used around the world. The types of structures and construction methods used in any country depend not only on availability of material but also soil type, weather conditions, infrastructure, availability of professionals and workers to carry out required tasks.

In North Cyprus, RC skeletons are the most common structural system constructed using conventional methods and bricks as infill walls. Furthermore, the most common surface finishing practice is 3-layer plastering using cement sand based plaster (gypsum is used as the 3rd layer sometimes) before carrying on painting. Reinforced concrete structures started to become more popular in North Cyprus since mid-1960s. From late 1970 till today the conventional reinforced concrete structures are still dominating building construction in Cyprus. Steel framed buildings are rarely found as their number is so far less than 5% of all the buildings in North

Cyprus. Steel as a material is not available locally but imported mainly from Turkey and mainly used for industrial buildings. Therefore steel structure and other locally rarely found building materials are excluded from this thesis as they are not common in North Cyprus.

Currently TS 500 (Turkish Reinforced Concrete Design Code, 2000) is commonly used for reinforced concrete structures design in North Cyprus. The concrete grade used in North Cyprus is minimum C20 (20 N/mm^2). Therefore, it is critical to take into consideration any defects or factors that could reduce the compressive strength of concrete members or alternatively increase the design load in concrete members particular when subjected to earthquake forces.

The functions of the buildings found in North Cyprus range between industrial, military, commercial, residential, public and educational buildings. However, this investigation is focused on mainly residential and some commercial buildings.

The prevailing heights of buildings of North Cyprus are normally ranged between low to medium rise. Table 1.1 and Figure 1.1 show the statistics of the number of buildings constructed in North Cyprus between the years 1993 and 2014. In the recent years there has been a construction boom in North Cyprus. The local construction industry was not ready for such increase in demand. The lack of enforcement of the existing rules and regulations are added to the poor supervision on site and increased number of inexperienced labour working for unqualified contractors result in a significant drop in the quality of buildings.

Table 1.1: Number of Buildings Constructed Between 1993 and 2014 (TRNC Statistical Yearbook 2014)

			District					Total
			Lefkoşa	Mağusa	Girne	Güzelyurt	İskele	
Year	1993	Urban	76	42	79	-	-	520
		Rural	134	114	75	-	-	
	1994	Urban	44	50	48	-	-	509
		Rural	187	85	95	-	-	
	1995	Urban	52	79	56	-	-	610
		Rural	167	107	149	-	-	
	1996	Urban	30	68	104	-	-	578
		Rural	99	114	163	-	-	
	1997	Urban	76	160	52	-	-	835
		Rural	174	204	169	-	-	
	1998	Urban	110	161	52	-	-	782
		Rural	147	146	166	-	-	
	1999	Urban	55	121	116	-	-	780
		Rural	186	154	148	-	-	
	2000	Urban	45	136	109	17	18	794
		Rural	150	80	139	63	37	
	2001	Urban	43	278	67	32	48	761
		Rural	84	40	84	39	46	
	2002	Urban	45	95	60	21	14	651
		Rural	157	58	86	32	83	
	2003	Urban	63	115	108	5	21	845
		Rural	179	75	190	53	36	
	2004	Urban	109	147	95	17	112	1,149
		Rural	169	67	331	46	56	
	2005	Urban	80	176	84	10	127	1,597
		Rural	215	116	647	32	110	
	2006	Urban	229	221	123	27	102	2,395
		Rural	320	137	995	55	186	
	2007	Urban	205	253	230	42	57	2,805
		Rural	389	186	1,178	76	189	
	2008	Urban	170	315	157	28	55	2,847
		Rural	432	181	1,217	83	209	
	2009	Urban	245	227	117	18	103	2,470
		Rural	346	140	1,013	58	203	
	2010	Urban	297	247	140	21	114	2,479
		Rural	348	141	906	56	209	
	2011	Urban	289	155	89	76	149	2,618
		Rural	424	227	967	58	184	
	2012	Urban	136	178	90	54	93	2,127
		Rural	339	241	822	52	122	
	2013	Urban	168	165	247	63	91	2,559
		Rural	460	509	754	48	54	
	2014	Urban	310	141	137	65	85	2,416
		Rural	354	445	766	5	108	
Overall Total			8,337	7,097	13,420	1,252	3,021	33,127

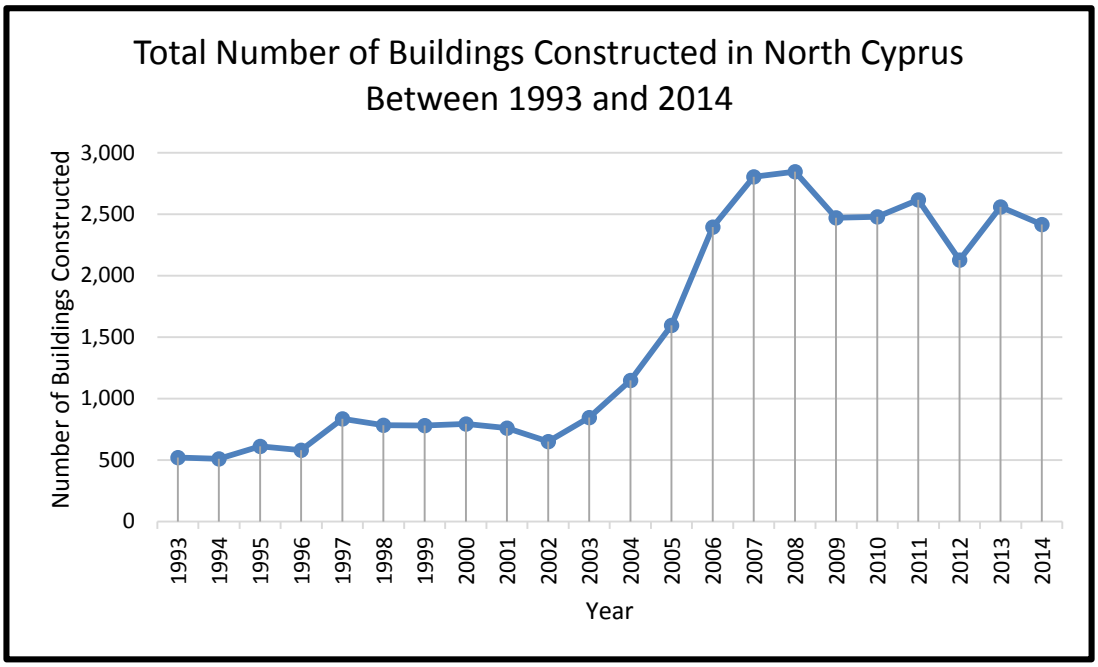


Figure 1.1: Buildings Constructed Between the Years1993 and 2014 (TRNC Statistical Yearbook 2014)

Non-structural defects and deteriorations in buildings have negative effects both on human and building lives. They mostly harm to the health and economy causing relevant socioeconomic harm to individuals and companies associated with the construction industry. Besides, reducing buildings' efficiency and aesthetic quality. On the other hand, structural problems develop risks leading to injuries or casualties. Most of these problems can be detected at their early stages through visible evidences. If not immediately treated, minor problems can grow into severe ones, becoming more expensive to repair, leading to failure or sudden collapse and jeopardizing lives.

Defects take place in numerous patterns and to various intensities in all sorts of structures of all ages. Mostly, these defects or structural problems arise due to error or omission that is breach of contract or negligence by designer/detailer, contractor, or user. In general, lack of care and knowledge in specification or workmanship are

the main reasons of various defects and structural problems. On the other hand, deterioration is natural process, which may be unavoidable, although minimized by care in design and the selection of materials and regular maintenance. Cracks, efflorescence, peeling on painting, mouldiness, rising dampness, soft storey, short column, shear cracks, compression cracks, irregularities in plan, irregularities in elevation and etc. are some of the most significant problems that occur in building of Northern Cyprus.

This thesis investigates the defects and problems of buildings and structures in North Cyprus. Reasons of these defects and problems were identified together with their most common precautions and available applied methods for preventing or reducing these problems. Selected case studies in different cities of North Cyprus were investigated, analysed and compared.

1.2 Literature Review and Previous Work Done

Various studies have been done on structural configuration design flaws and in describing building defects' symptoms and classifying them in deferent ways. Besides investigated their sources and proposing remedies and ways of prevention.

Suffian (2013) expressed the importance of maintenance role on building defects by examining a number of Social Security Organization (SOCSO) buildings across Malaysia. Celikag and Ozbilen (2007) examined over 100 construction sites in North Cyprus and to identify construction defects and inadequacies. Naimi and Celikag (2010) investigated 14 buildings in Mağusa, North Cyprus devided into 2 groups: under-construction, recently constructed and old buildings to indentify their defects and their reasons. Celikag and Naimi (2011) identified variety of construction

problems in North Cyprus and promoted for the use of alternative construction system (steel structure). Sassu and De Falco (2014) collected and reported data of defects from buildings in Italy and classified them according to various categories based on the type of damage encountered and carried out a comparison statistical study. Ozmen and Unay (2007) wrote about and gatogorized comonly encountered seismic design faults of residential buildings in Turkey. Ozay and Ozay (2005) discussed in their article the most common defects on housing surfaces in Northern Cyprus.

Emmons (1993) illustrated and classified concrete defects and described their causes together with their repair technique. Charleson (2008) wrote and illustrated about seismic design. Trotman, Sanders, and Harrison, (2004) explained and illustrated in their book about dampness and its effects, causes, diagnosis and remedies.

Chin-man (2002) publish a Building Maintenance Guidebook under the national Codes of Practice, Design Manuals and Guidelines of Hong Kong when he describes the symptoms, causes and common appropriate solutions of buildings' defects in Hong Kong.

1.3 Aim and Scope

The dissemination of failure-related information, with detailed description of their causes, mainly for civil engineers and architects, is necessary for developing awareness on the building construction process and preventing further failures.

The aim of this thesis is to identify, highlight and help to provide knowledge and awareness about building defects and problems due to design and construction faults to construction professionals such as engineers and architects in order to resolve and

avoid these problems through proper design, construction process and quality control for RC structures.

This thesis investigates various common defects and problems in RC buildings of different ages together with their causes and ways of avoiding them. Selected case studies in North Cyprus were visited to identify inadequacies in building design and construction.

1.4 Organization of the Thesis

The first chapter of this thesis starts with a general introduction by defining the problem, describing the regional construction practice and urban context of North Cyprus. Published previous work done related to the topic of building defects both structural and non-structural were reviewed. The aim of the study were stated and the scope were defined.

Chapter 2 starts by presenting a category of structural problems which is related to earthquake and designing, namely: seismic design faults. The title is then divided and subdivided into various problem types in the following sections. The second section is concerned about weak column-strong beam problem. While the third section is about horizontal and vertical structural configuration problems, such as: irregularities in plan and elevation, elementary design faults about structural members and short column.

Chapter 3 describes the types of defects which occur in concrete and reinforce concrete which is the dominant material used for the construction in North Cyprus together with their precautions, prevention, remedies or repair if available. After the introduction section, the second section is concerned about corrosion of metals

embedded in concrete and the accelerators of such corrosion together with the accompanied consequences of cracks and spalls. The third section describes drying shrinkage cracks or cracks due to moisture effects. The fourth section is concerned about construction defects particularly those due to faulty workmanship of designers, detailers or contractors, e.g., improper reinforcing steel placement, premature removal of forms, cold joints, segregation, honeycombing and improper grades of slab surfaces. The fifth and last section is concerned about structural cracks in concrete, i.e., cracks due to load effects, e.g., punching shear cracks, cantilevered member's cracks and settlement cracks.

Chapter 4 describes the non-structural defects, such as: waterproofing defects, defected wooden doors and non-structural cracks, e.g., joint cracks. Besides, common surface defects, e.g., dampness, efflorescence, paint peeling, mouldiness, staining and wall finished workmanship problems.

Chapter 5 is the case studies chapter. It starts with brief introduction followed by defining the methodology of the carried investigation and the faced challenges and limitation of the investigation before presenting the case studies and ending by presenting the findings and discussing the results.

The conclusion chapter starts with a highlight and summary of the problem, causes and solutions. Followed by recommendation for the construction and maintenance practice for the buildings of North Cyprus.

Chapter 2

SEISMIC DESIGN FAULTS

2.1 Introduction

Natural disasters, e.g. earthquakes, can expose flaws in the design of structures. Flaws in design, conceptual planning or in some cases an inefficient system of codes and regulation may lead to disastrous results in urban contexts. Seismic design faults negatively affect the seismic performance and structural behaviour of buildings.

During the last century there has been fast progress in design standards and construction methods. Introduction of earthquake codes for structural design helped researchers and engineers to design buildings for more realistic loads. North Cyprus contains earthquake zones 2 and 3 only (Table 2.1). There are a number of tremors throughout the year some of which are high in magnitude. Cyprus has been hit in the recent years by earthquakes of magnitude up to 6.8 (Table 2.2). Therefore it is necessary when designing structures to take into account earthquake loads and pursuit achieving quality design and work to increase the safety of structures and their occupants.

Table 2.1: Local Site Classes in North Cyprus (Regulation on Buildings to Be Constructed in Earthquake Region in TRNC, 2015, p.165)

Municipality	Earthquake Zone
Akdoğan	2
Akıncılar	2
Alayköy	3
Alsancak	3
Beyarmudu	2
Büyükkonuk	3
Çatalköy	3
Değirmenlik	3
Dikmen	3
Dipkarpaz	3
Esentepe	3
Mağusa	2
Geçitkale	3
Girne	3
Gönyeli	3
Güzelyurt	2
İnönü	3
İskele	3
Lapta	3
Lefke	2
Lefkoşa	3
Mehmetçik	3
Paşaköy	3
Serdarlı	3
Tatlısu	3
Vadili	2
Yeni Boğaziçi	3
Yeni Erenköy	3

Table 2.2: List of Earthquakes that Hit Cyprus in the Recent Years (United States Geological Survey (USGS))

Date	1995/2/23	1996/10/9	1999/8/11
Magnitude	5.9	6.8	5.6

Before 1982 earthquake resistant structural analysis for building of up to four stories was not obligatory and could be skipped if the structural elements were buffed or if a certain configuration of shear walls were provided. The 1975 version of Turkish earthquake code was the first earthquake code to be followed in North Cyprus (in the early 1990s) followed by the 1997 version before North Cyprus having its own earthquake code in 2005 which is basically an adapted 1997 Turkish Earthquake Code. Hence, the majority of old buildings were not designed to withstand realistic earthquake loads and some may need strengthening.

The main goal for any earthquake code is the prevention of casualties. Table 2.3 below shows what the Turkish Earthquake Code expects for the structural and non-structural elements of a building to behave during different earthquake intensities (Ministry of Public Works and Settlement, 1997, 2007).

Table 2.3: Turkish Earthquake Code Expectation of Structural and Non-Structural Elements Behaviour during Different Earthquake Intensities

Small earthquake	**Medium earthquake**	**Strong earthquake**
No damage	Damage should be within repairable limits	No partial or total collapse

This chapter attempts to contribute to the effort of raising an awareness about the concept of earthquake resistant design and explores the design flaws that are made by designers.

2.2 Strong Beam and Weak Column Problem

The aim of seismic design is to prevent building collapse in an event of an earthquake. This can be achieved by absoping the earthqake energy through ductile hinges at the joints between columns and beamns. In week column-strong beam frames, hinges form at column ends. While in strong column-weak beam frame, hinges form at bream ends. Figure 2.1 bellow compares between the undesirable week column-strong beam frame (Figure 2.1a) and the desirable strong column-weak beam frame (Figure 2.1b). The basic idea behind adopting the strong column-weak beam method is to avoid columns failing first, loosing a beam is less dangerous than lossing a column. Therfore, week column-strong beam designs are prohibited by all codes and must be avoided. Column depths must never be less than those of the beams in order to avoid strong beam-weak column problem and achieve the seismically desirable frames ductility.

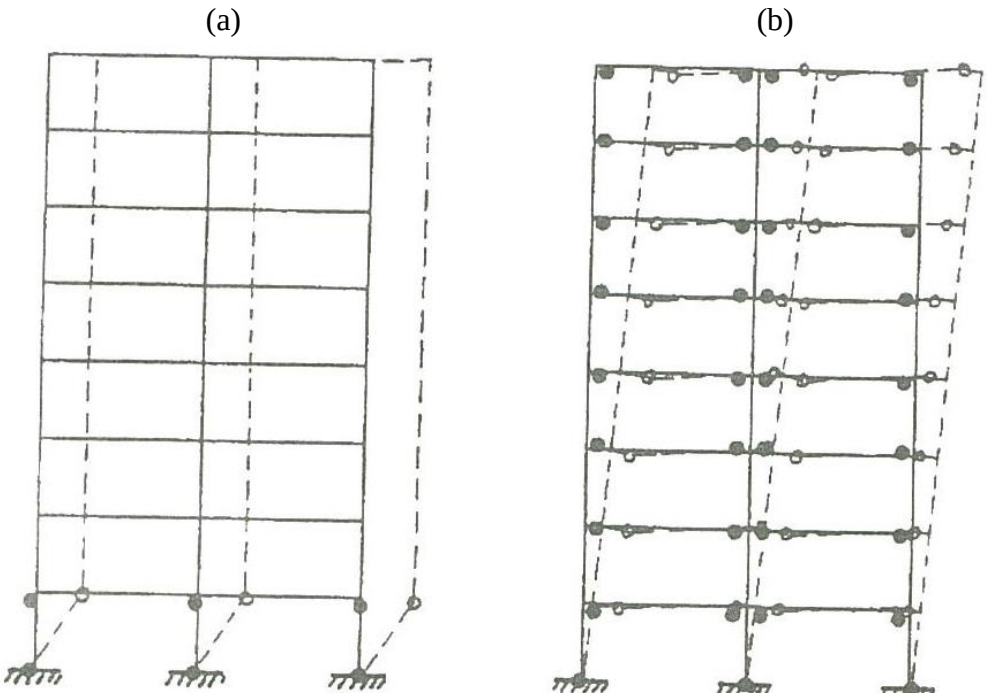


Figure 2.1: A Comparision Between Two Frames; the Undesirable Weak Column-Strong Beam on the left and the Desirable Strong Column-Weak Beam on the right

2.3 Structural Configuration Problems

Configuration in structural design means the horizontal and/or vertical arrangement of structure and its elements. The seismic performance of a building configuration is the combination the seismic performance of all individual structural members with it. The structural configuration quality determines the survivability of a building after an earthquake.

Building configuration is mainly the responsibility of designers because designers decides on the overall scheme of a structure. The approach towards regularity and symmetricity of plans and elevations should be adopted by designers while designing any building. Buildings are classified into regular and irregular buildings. Designers should always aim for regularity by minimizing or eliminating irregularities. Irregularities lead to unfavourable seismic behaviour. Irregularities are also uneconomical since codes ask for structural members of irregular buildings to be stronger than ordinary. The American Institute of Civil Engineers standard ASCE/SEI 7-05 (2006) forbids the construction of irregular buildings in high seismicity regions.

Irregularities increases the chance for a structural and non-structural damage during an earthquake. However, by implementing advanced engineering techniques some little to medium irregularities can be tolerated by structural engineers and design codes. Normally the structural designer builds a 3D digital model of buildings with irregularity before applying code-specified seismic forces into it. This topic is subdivided in the followings into horizontal and vertical structure configuration problems.

2.3.1 Horizontal Structure Configuration Problems

Horizontal structure is a crucial part of any earthquake force path since earthquake forces travel horizontally first through horizontal structure before traveling vertically downwards all the way to the foundations. Every building needs a horizontal structure which resists and circulate earthquake forces into columns and shear walls. For that reason, the description of horizontal structure always goes before vertical structure in almost every seismic design related literature.

In general, the best method to approach an adequate horizontal configuration is to reduce the complexity of floor plan geometry by dividing it into regular shapes using seismic separation gaps. This section is concerned about horizontal configuration, i.e., floor plan shapes and its structural layout in plan. This section is subdivided in the followings into these subtopics: irregularities in plan, elementary design faults in beams and slabs.

2.3.1.1 Irregularities in Plan

In 2007 Turkish Earthquake Code, irregularities in plan are ordered as: torsional irregularity, floor discontinuities and projections in plan.

2.3.1.1.1 Torsional Irregularity (Torsion Eccentricity)

To minimize torsion in buildings during earthquake, it should be taken into consideration by designers when designing floor plans to minimize the distance between the centre of mass and the centre of rigidity or resistance as much as possible (making them coincide is the best scenario). Distance between centre of mass and centre of rigidity creates eccentricity and as a sequence, a torsion moment equal to the inertia force (lateral earthquake force) multiplied by eccentricity twists the building around the centre of rigidity. Efforts must be made to prevent torsion. If a structure twists, the columns furthest away from the centre of rigidity endure the

most damage caused by excessive torsion-induced horizontal deflections. The location of the centre of mass usually influenced by the geometrical centre of the floor plan and therefore not convenient to manipulate; on the other hand, the location of the centre of rigidity/resistance can be manipulated by modifying the cross-sections (stiffness) and the locations of vertical structural members (Figure 2.2).

Figure 2.2a shows an ideal situation of a perfectly symmetrical plan where the centre of rigidity and centre of mass coincide, thus zero eccentricity exist. Figure 2.2b shows how increasing the size of columns on one side on a plan shifts the centre of rigidity and thus creating eccentricity. Figure 2.2c shows how the columns furthest away from the centre of rigidity endure the most deflection and thus damage.

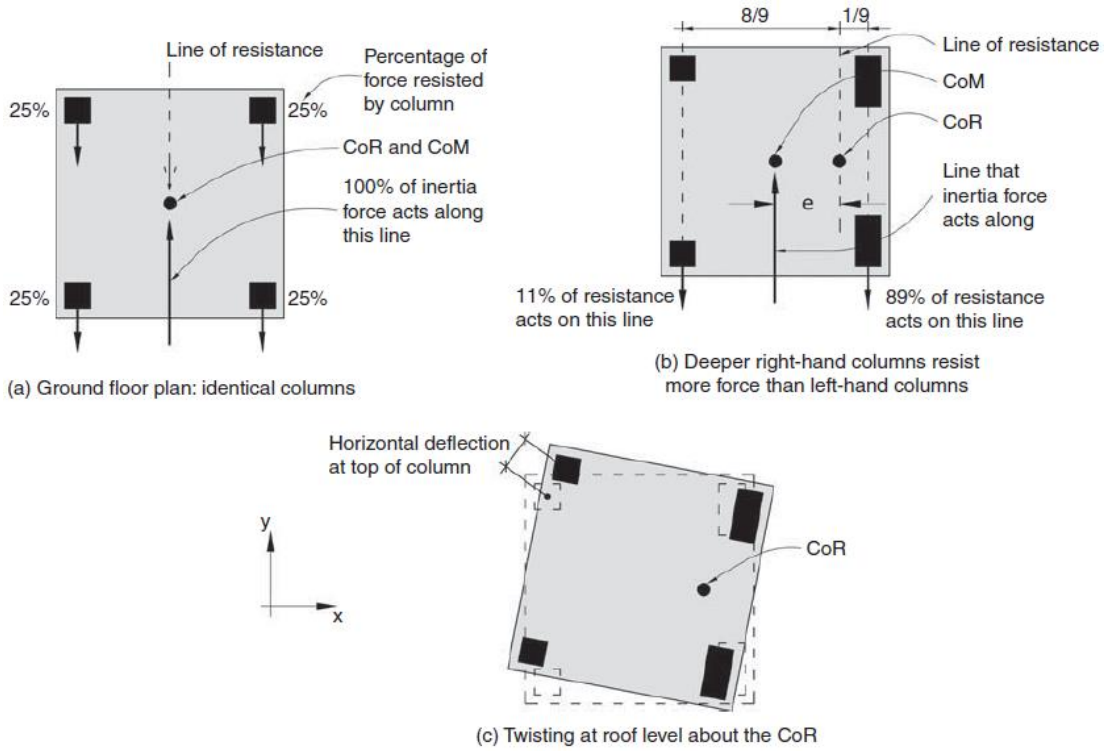


Figure 2.2: A Symmetrical Structure is Modified to Illustrate Torsion and How it Causes a Building to Twist (Charleson, 2008)

The uniform earthquake force acting on the floor plan is simplified to a point force acting at the centre of mass. This horizontal forces is resisted by columns and shear walls. In general, in both direction x and y, the length of eccentricity should be kept less than quarter the length of the structure measured perpendicular to the direction of earthquake force (Charleson, 2008).

Ozmen and Unay (2007) illustrated in an asymmetrical floor plan example the possibility of moving the centre of resistance closer to the centre of mass in order to minimize the torsion eccentricity and the resultant shear forces by the addition of shear-walls (Figure 2.3).

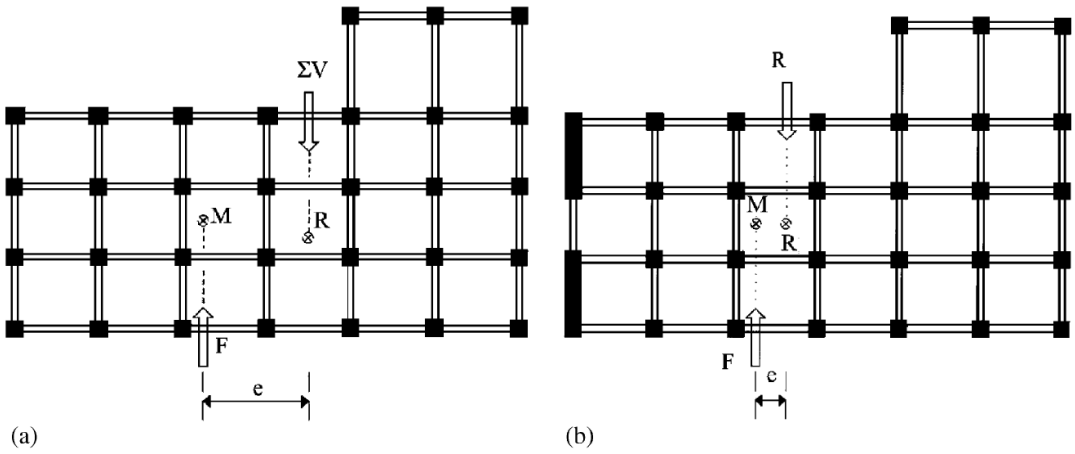


Figure 2.3: Modifying the Centre of Rigidity/Resistance (Ozmen and Unay, 2007)

Lift cores or staircases enclosed in shear walls should be located in a way to eliminate or minimize the distance between the centres of mass and the centre of rigidity/resistance. Locating them on one side of the structure will create excessive torsion eccentricities and unequal deflections (Figure 2.4a). They should be

distributed symmetrically across the plan or placed at the centre of the building (Figure 2.4b) (Ozmen and Unay, 2007).

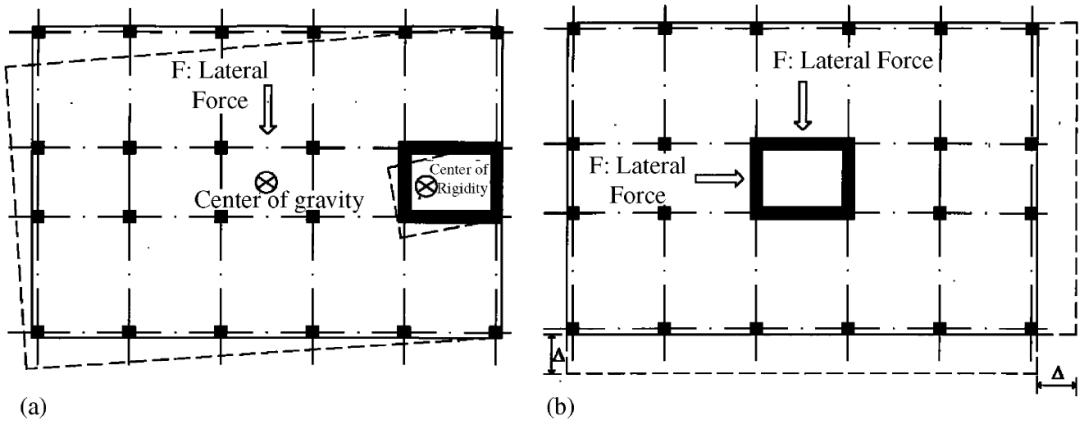


Figure 2.4: Location of Shear-Walls (Ozmen and Unay, 2007)

According to the 2007 Turkish Earthquake Code, a building is considered torsionally irregular if the ratio of the maximum displacement to the average displacement for any of the two orthogonal earthquake directions at any storey is more than 1.2 in the same direction. In any torsionally irregular building where the rigidity is not symmetrically distributed, the less rigid portion of the structure will do more shift (and damage) than the more rigid portion.

2.3.1.1.2 Floor Discontinuities

Cavities in floor plans serve variety of purposes, such as:

- To provide stairs, escalators or lefts.
- Air ventilation or light cavity purposes.
- Spatial comfort and aesthetics purposes.
- Building services cavities, such as; air ducts and pipes.

The lateral inertia forces on the structure are distributed to vertical structural members by the floor slabs. Large cavities within floor plans ruin their structural integrity. Thus, designers should locate them in a way that they will not endanger the diaphragm's ability to transfer horizontal loads to columns or shear-walls. Any interruption on the earthquake force path must avoided. Thus, the optimal locations for cavities are where bending moments or shear stresses are low. Figure 2.5d shows a cavity located in minimum shear stress area. Generally, the following two principles should be considered by designers when locating a floor slab cavity:

- The cavity should not cuts through a chord or beam (Figure 2.5a). If cavity location cannot be adjusted, then the edge beam must continue through the cavity to restore continuity of the diaphragm chord (Figure 2.5b). The Cavity in Figure 2.5d is in the centre of the floor plan safely away from beams which carry tension and compression stresses.
- Placement of a cavity should not be located on areas of maximum shear forces as shown in Figure 2.5c. There is 2 ways that can be implemented to prevent undesirable shear failure mode in this case:
    a) The length of Cavity must to be shortened.
    b) The depth of floor slap or/and beams must be increased and far more heavily reinforced in those areas.

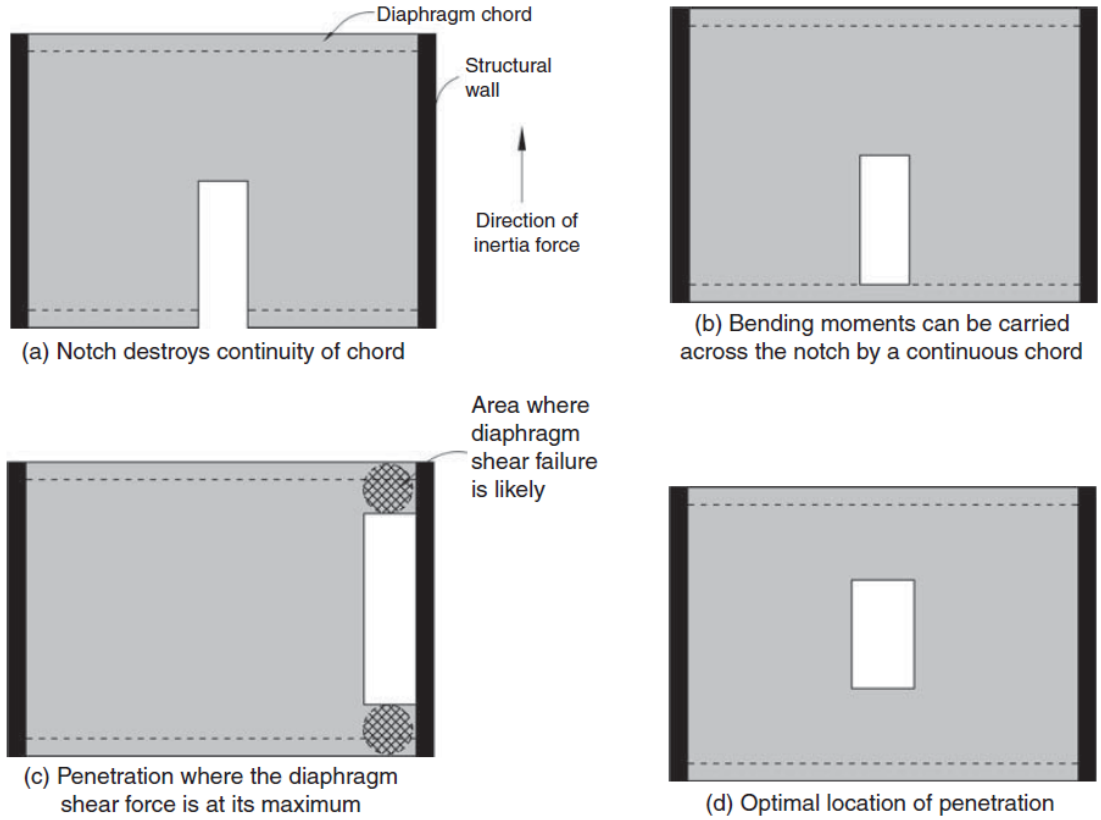


Figure 2.5: Diaphragm Cavities in Various Locations (Charleson, 2008)

The 2007 Turkish Earthquake Code consider a building to be irregular by floor discontinuity if the total area of openings exceed third of gross floor area. Cavities introduce potential weakness into diaphragms and could negatively affect the dynamic behaviour of the building as there will be uneven horizontal deflections leading to additional shear stresses. The following are some options and methods that can be applied when designing Cavities in floor plans to reduce and overcome their negative effects:

- Increasing the rigidity of the columns and beams surrounding the opening.
- Positioning shear-walls around the openings.
- Reducing the dimensions of openings.
- Thickening and reinforcing the surrounding of an opening.

- Bridging the opening slot by introducing a section of diagonal steel framing or inserting horizontal vierendeel frame.
- Separating the structure into portions/sections (independent structures) with the cavity between them.

Another type of diaphragm discontinuity is when a floor diaphragm consists of two or more levels. Figure 2.6 illustrates this scenario and shows a step in a diaphragm.

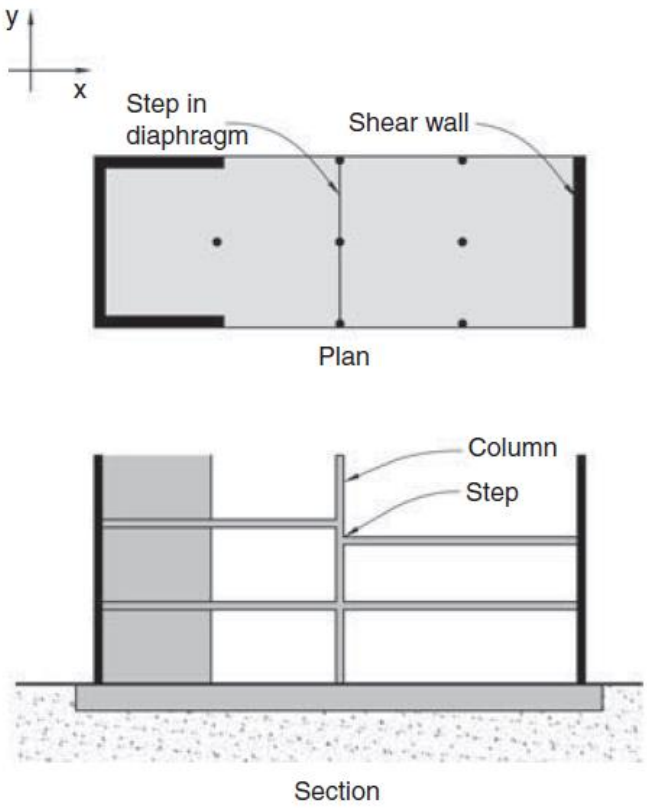


Figure 2.6: A Stepped Diaphragm (Charleson, 2008)

Two ways to overcome this type of discontinuity:

a) Divide the structure into two independent structures
b) Introduce a shear-wall or moment frame, depending on the existing structural system, along the line of the step.

2.3.1.1.3 Projections in Plan (Re-Entrant Corners)

Projections in plan can be in many geometry shapes (Figure 2.8). If these projections are too large they impose possibility for damage due to the different dynamic responses of each projection which leads to additional stresses on the structure (Figure 2.7). During an earthquake, the more flexible wing, depending on the direction of inertia force, swings about the stiffer area (torsional rotation effect) which may result in:

- Damage in diaphragm joint between projections, due to critical shear forces and moments occurring in the intersection line of the projection and the main body.
- Damage in the far end columns of the more flexible wing, due to torsion eccentricities.

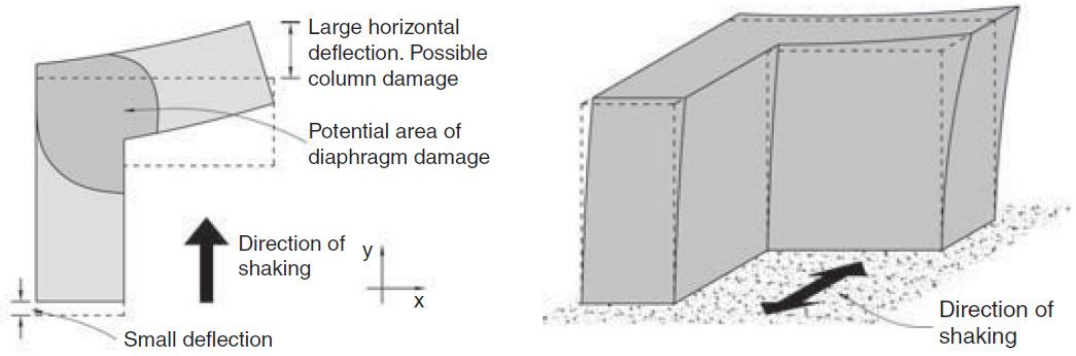
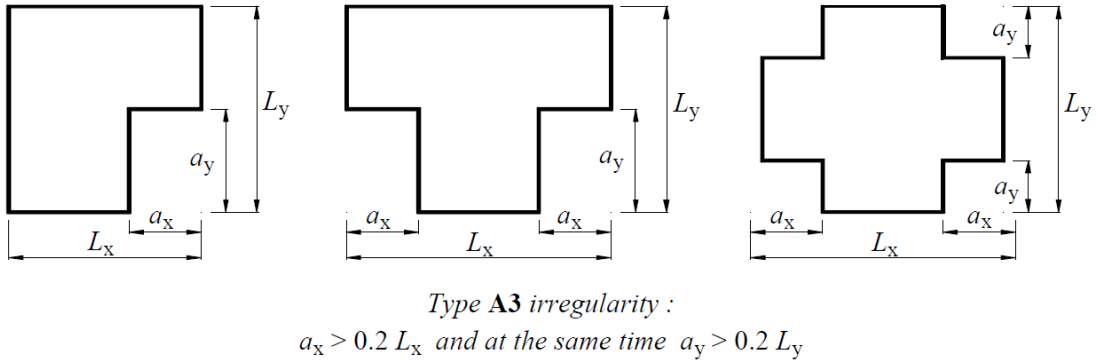


Figure 2.7: When a Building is Under the Dynamic Loads of Earthquake, Re-Entrant Corners Can Deflect in a Way Creating Possible Damage at Joints (Charleson, 2008)

Codes require undertaking a 3D dynamic analysis for buildings with re-entrant corners. Most codes define projections in plan irregularity as where the ratio of the length of a projecting corner to the length of the entire plane exceeds 15% in the

same. However, in the 2007 Turkish Earthquake Code the ratio is set to 20% (Figure 2.8).



Type **A3** *irregularity :*
$a_x > 0.2\ L_x$ *and at the same time* $a_y > 0.2\ L_y$

Figure 2.8: 2007 Turkish Earthquake Code Definition of an Irregular Projections in Plan (Ministry of Public Works and Settlement, 2007)

If re- entrant corners are necessary, there are two ways to design them as to avoid diaphragm tearing and excessive horizontal deflections damaging columns:

- Balancing the projections' relative stiffness by playing with shape and reinforcements. Nevertheless, this method might not be structurally sound, if the wings are long or if the diaphragm is weakened by cavities where the projections join.
- The common and most preferable solution method which should be applied for re-entrant corner buildings whenever possible is to divide and separate the structure into independent structures or sections with structural joints in between (Figure 2.9).

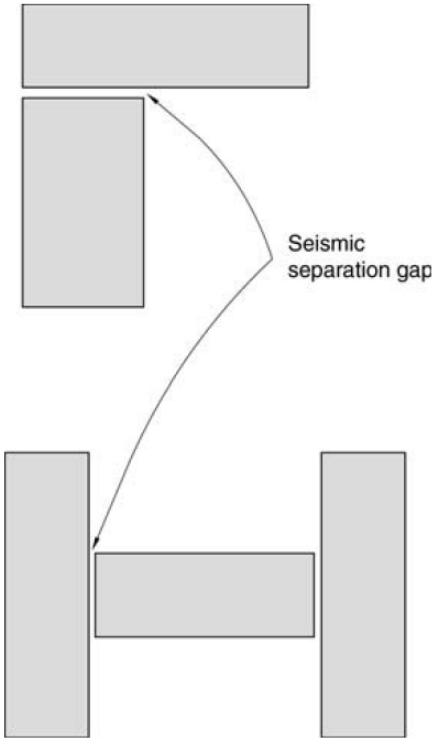


Figure 2.9: The Plan Irregularity of Re-entrant Corners can be solved by separating the structure into several blocks (Charleson, 2008)

2.3.1.2 Beams' Elementary Design Faults

2.3.1.2.1 Non-Continuous Beams

Designing non-continuous beams in floor plans should be avoided. When having a non- continuous beam, the lateral earthquake inertia force within this beam is transferred to the structural elements in the opposing side through the relatively thin floor slab (Figure 2.11). Calculating the pattern and the effects of this force distributions is complicated. The lateral displacement properties of the entire structure should always be considered by the designer. Two design approaches which increases the rigidity of the slab that could be applied if such configuration is absolutely necessary (Ozmen and Unay, 2007):

- Increasing the slab thickness between the non-continues beam.
- Using joist slab between the non-continues beam.

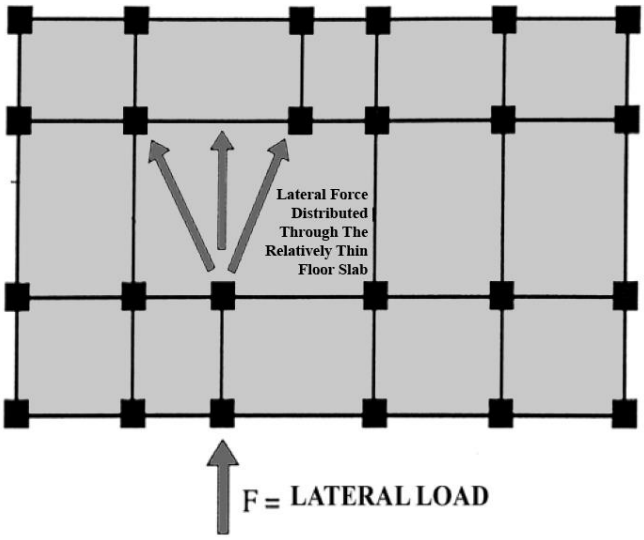


Figure 2.11: Non-Continuous Beam in a Floor Plan (Ozmen and Unay, 2007)

2.3.1.2.2 Non-Uniform Beam's Span and Cross-Section

Designers should avoid non-uniform beam's span and cross-section. Non-uniform spans of beams will vary the lateral rigidity of the diaphragm. Furthermore, these changes in span lengths are often accompanied with alternation of beam cross-section; with the longer spanning beam having greater depth and the shorter spanning beam having less depth, due to varying imposed loads on them. These non-uniformities makes it difficult to estimate critical stresses and difficult to predict the behaviour of the building during an earthquake. Moreover, there will be an increase in the cost of formworks due to non-uniformity (Özmen, 2008). Besides, complications in the details of steel bars reinforcements and difficulties in producing them (Figure 2.12). However, variations of beam spans could be acceptable if the design is symmetrical in plan. Yet, care should be taken in minimizing eccentricities in joints of beams with different cross-sections. If the joint is not properly reinforced, failure can easily occur at the joint.

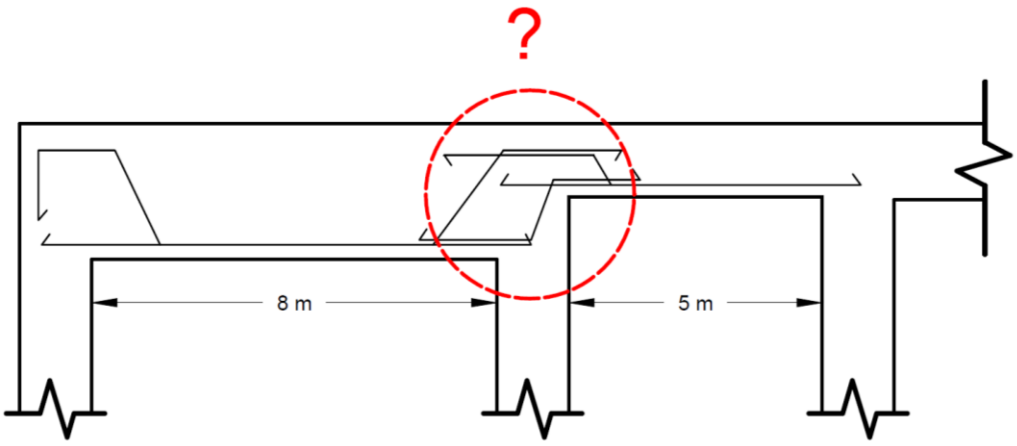


Figure 2.12: Non-Uniform Span and Cross-Section of a Beam (Ozmen and Unay, 2007)

2.3.1.2.3 Absence of Vertical Support at Beams' Intersections

In some designs, vertical load-bearing member at beam-to-beam intersection are either absent or shifted (Figure 2.13). This could be dangerous under horizontal earthquake inertia forces since one beam will be exposed to a large point load from another at the intersection generating critical moments which may lead to large deflections and cracks on the beams. Furthermore, such a configuration would require additional reinforcements and a big increase in the beam cross-section, therefore increase in the cost. When such a configuration cannot be avoided, the intersection point should not be close to the column/shear-wall (Figure 2.13b). One should remember that stiffness is negatively proportional with the length of the element. The short beam shown in Figure 2.13b can create very critical torsion moments on itself and the adjacent beam and column (Özmen, 2008).

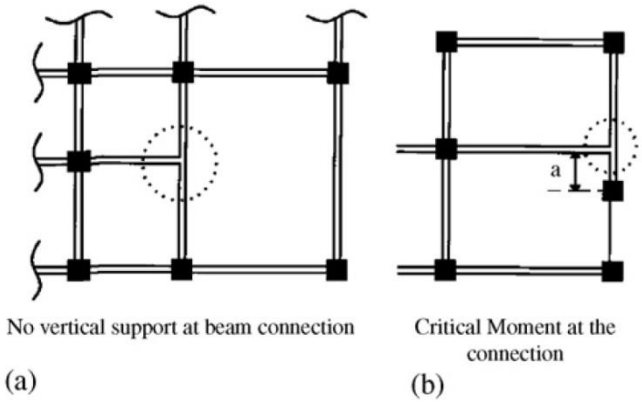


Figure 2.13: Beams Intersecting Without Vertical Supports (Ozmen and Unay, 2007)

2.3.1.2.4 Beams and Frames with Broken Axis

Breaking the axis of beams and columns in plans makes them less resistant to lateral forces as additional torsion forces will develop during force transferring between them (Figure 2.14a). The configuration shown in Figure 2.14b forms a short and over-rigid beam, thus should be avoided (Özmen, 2008).

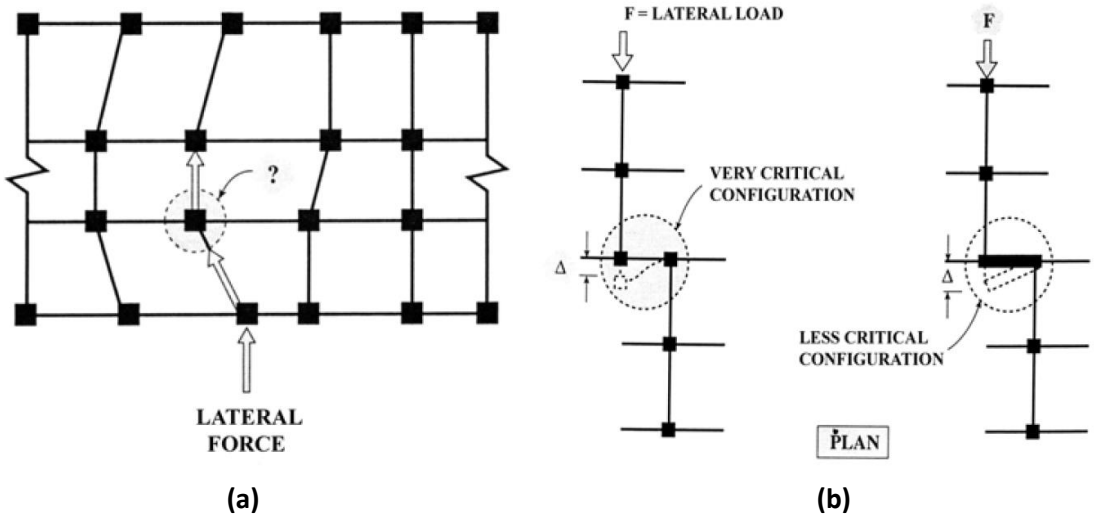


Figure 2.14: Beams with Broken Axis (Özmen, 2008)

2.3.1.3 Slabs' Elementary Design Faults

2.3.1.3.1 Over-Stretched One-Way Slabs

Sometimes when designing central long corridors for circulation purpose in multi-storey buildings, designers use over-stretched one-way slabs. This over-stretched one-way slabs are created by omitting the beams bellow the corridors to avoid visual or service obstacles in the ceiling of the corridor bellow. Thus, breaking the continuity of the structural axes which leads to structural deficiencies (Figure 2.15). Designers should avoid such a design by not omitting beams and adding suspended ceilings to overcome and hide visual and service problems without sacrificing

structural integrity. Over-stretched one-way slabs break the continuity of beams which leads to non-continuous beams design fault explained earlier.

Over-stretched one-way slab creates an area of weekend rigidity within the diaphragm that transfers lateral earthquake inertial forces to vertical structural elements. Therefore, relatively large deflections can easily occur under lateral earthquake inertial forces. Moreover, since it is difficult to place reinforcement in the long direction of such a long slab, frequent contraction cracks will occur (Özmen, 2008).

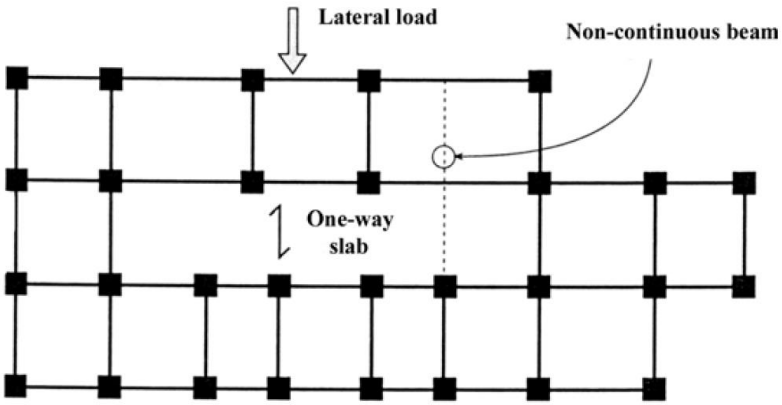


Figure 2.15: Over-Stretched One-way Slab (Özmen, 2008)

2.3.1.3.2 Cantilever Slabs

Cantilever projections in RC buildings are either open as in balconies or enveloped by masonry to act as extension for rooms. If the projection of cantilevered slab is long, it is prone to large deflection even without earthquake lateral inertia loads. Enveloped cantilevers are more prone to critical deflections than open cantilevers especially under earthquake forces due to the weight of the masonry wall positioned at the far end of the cantilevered slab, which may results in partial collapse. While

designing cantilevered projections, it is best to have four beams under the cantilevered slab as following (Figure 2.16):

- Two cantilevered beams which should be continuous and
- Two side beams one of them under the far end of the cantilevered slab and the other connecting the columns supporting the cantilever.

This way increases the overall rigidity of the cantilever. Besides, the earthquake lateral inertia forces will be transferred directly to the supporting columns without being distributed to the relatively less rigid floor slabs (Özmen, 2008).

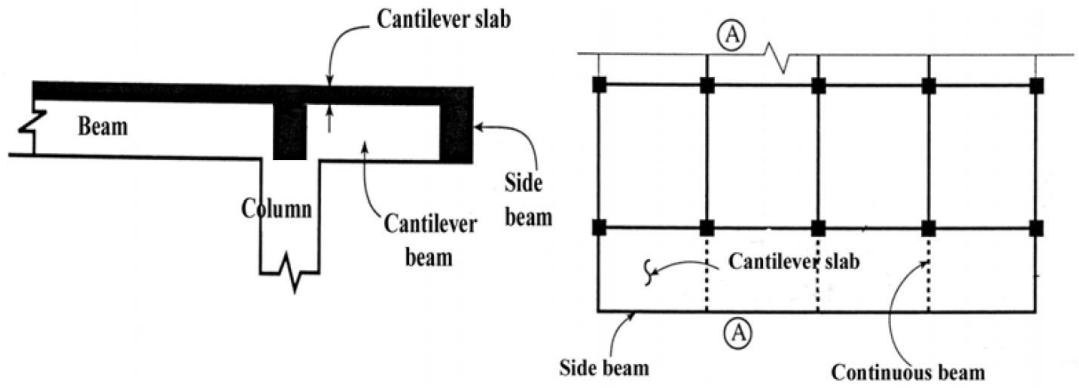


Figure 2.16: Cantilever Slabs (Özmen, 2008)

2.3.1.4 Pounding and Separation Problems between Buildings

The shape of the building and its mass distribution influences its seismic behaviour. Complex buildings with irregular mass distribution, like those consisting of large numbers of blocks, will have varying natural periods and lateral rigidities between its block, each block will behave independently during an earthquake. As a result, critical torsions and shear stresses will develop at the regions where they join. Therefore, to solve this problem and accomplish a successful seismic behaviour of

such complex buildings, each block have to be divided into structurally independent sections. The blocks should be disconnected from one another by separation joints, which can be designed in multiple styles.

Irregular distribution of masses can take place within a building in multiple ways. A structure can appear to be regular from outside but additional masses of building services, such as heavy machines and water tanks can develop torsion eccentricities and additional shear stresses depending on where they are located within a building. Projections in Plan (Re-entrant corners), projections in elevation (cantilevers) and setbacks are another patterns of irregular mass distribution frequently detected in residential buildings. Especially, if they were not symmetrical around the centre of the structure as they will cause torsion eccentricities.

On the other hand, some urban residential building patterns contains buildings very close to each other which could be very dangerous during an earthquake and should be avoided. Every building will swing differently during an earthquake according to its own natural period. Therefore, buildings should be located after setbacks of their boundary except street frontage in order to achieve some gaps between them. The drift of a building during an earthquake should not reach the neighbouring site boundary. If there are no adequate separation between the buildings and they swing toward each other, they will hit each other which could critically damage or destroy structural elements leading to a collapse or partial collapse.

The amount of spacing between buildings is calculated on the flexibility and height of a building. The required gap obviously increases with height. On the other hand, to avoid uneconomical wide gaps, stiff structural system could be adopted in the

design. The maximum allowed drift of a building during an earthquake is specified in typical codes as 0.02 X height. Some codes allow a 50% reduction of the spacing with the condition that the floor levels of adjacent buildings align, since pounding a floor slab into a floor slab is not as dangerous as a floor slap hitting columns or shear-walls of the adjacent building. The minimum spacing requirement between buildings specified by the 2007 Turkish Earthquake Code is 30 mm for buildings up to a height of 6m. From there on, the spacing should be increased 10 mm for every 3 m raise in the height. However, even if these suggestions of the code are followed, sometimes it could still be inadequate. The adequacy of spacing should be checked and confirmed by calculations or computer simulation (Ozmen and Unay, 2007). Separation gaps are usually lined and covered using flexible sacrificial materials to allow movements, as trying the separated structures should be avoided (Charleson, 2008).

2.3.2 Vertical Structure Configuration Problems

This section is subdivided in the followings into these subtopics: irregularities in elevation, elementary design faults in vertical structural elements and short column.

2.3.2.1 Irregularities in Elevation

In 2007 Turkish Earthquake Code, Irregularities in elevation are: inter-story strength irregularity (weak story), inter-storey stiffness irregularity (soft storey), and discontinuity of vertical structural elements.

2.3.2.1.1 Inter-Storey Strength Irregularity (Weak Storey)

Weak storey occurs when omitting or reducing the cross section area of columns, shear walls and masonry partition walls of the storey immediately bellow. Weak storey can occur at any storey level (except top storey level), but it most commonly

occurs in ground storey level. This is because a lot of medium-rise apartment building in North

Cyprus are designed with an open ground storey to function as parking. Masonry partition walls contribute to the resistance of earthquake force together with columns and/or shear walls. Therefore omitting masonry partition walls in a story make it weaker than the storeys above and as a result higher stresses are imposed on the columns of the weak storey which might lead to failure during an earthquake.

The 2007 Turkish Earthquake Code specifies for a storey to be weak is when the ratio of the sum of cross section area of columns and shear walls and 0.15 of masonry partition walls of a storey to the storey immediately above is less than 0.8.

It is best to design continuous masonry partition walls and not to omit them on lower storeys, but if an open storey is unavoidable and the ratio is between 0.8 and 0.6, then the columns and/shear walls of the weak storey must be buffed while taking into consideration that the cross section area of columns and/or shear walls in a storey should never be greater than the storeys below). However, if the ratio is less than 0.6, the codes prohibits such a design and redesigning shall be carried (Turkish Earthquake Code, 2007).

2.3.2.1.2 Inter-Storey Stiffness Irregularity (Soft Storey)

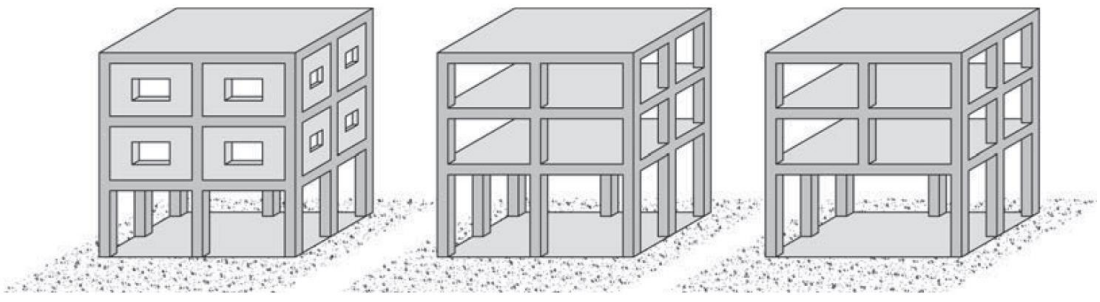
Soft storey irregularity is much the same as weak storey irregularity. It occurs when a level in a structure is more flexible and/or weaker than the level immediately above. However in soft storey irregularity, average story drift is in concern rather than the storey effective shear area which is linked to weak story irregularity. Soft storey occurs commonly in on ground floors in residential building in North Cyprus, which are functioning as shopping stores or more commonly as car parking. The danger of

such irregularity is that earthquake energy will concentrate on this weaker soft storey, which will cause serious damage to the storey's columns leading to collapse. The followings are three factors that contribute in the occurrence of soft story in floors (Ozmen and Unay, 2007):

I. Relative absence of masonry infill walls in one of the floors (Figure 2.17a). Masonry infill walls contribute in the lateral rigidity of a floor, omitting them in a floor, such as in the case of ground floor car parking, would subject its columns to a significant increase in moment and shear forces (this cause both weak and soft storey).

II. Increasing the height of the floor than the height of the floors above without decreasing the columns cross-section of those on the floors above (Figure 2.17b). The lateral rigidity of the floor will be less than of those above and thus its drift will be more (this cause soft storey only).

III. Omitting columns or shear-walls in a lower floor (non-continuous column or shear-wall) (Figure 2.17c). It is more critical in lower floors such in the case of ground floor which would subject its columns to very critical shear stresses (this cause both weak and soft storey).



(a) Stiff and strong upper floors due to masonry infills

(b) The columns in one storey longer than those above

(c) Soft storey caused by discontinuous column

Figure 2.17: Factors Contributing in the Occurrence of Soft Story (Charleson, 2008)

According to Charleson (2008) this irregularity is the most serious among irregularities in elevation and it is the most prevalent cause for multi-storey buildings collapses. A seismic code may tolerate some reasonably minor degree of soft storey. However, special analyses must be undertaken with additional strength and ductile detailing.

The 2007 Turkish Earthquake Code specifies for a storey to be soft is when the ratio of average storey drift at a storey to the storey immediately above or below is greater than 2.

2.3.2.1.3 Discontinuity of Columns or Shear Walls

In some old designs, columns or shear-walls are omitted in some floors due to spatial, functional or aesthetical purposes. A beam could support the load of a column, but it would be uneconomical as it will need a relatively huge beam dimensions since the 2007 Turkish Earthquake Code requires a 50% increase of the design loads of the beam supporting the column and the other beams and columns neighbouring to the beam. Besides, the beam will be subject to critical moments and shear stresses under earthquake forces (Ozmen and Unay, 2007). However, it is prohibited by the 2007 Turkish Earthquake Code for:

- Columns to be supported by cantilever beams or gussets of the columns underneath.
- Shear-walls to rest on columns or/and beams.

The 2007 Turkish Earthquake Code described the cases which causes this type of irregularity as: where columns or structural walls are omitted at lower stories which causes columns of the stories immediately above to be carried by bellow gusseted columns (Figure 2.18a) or beams (Figure 2.18b), or where shear walls to

be carried by columns (Figure 2.18c) or beams (Figure 2.18d) of the storey immediately bellow.

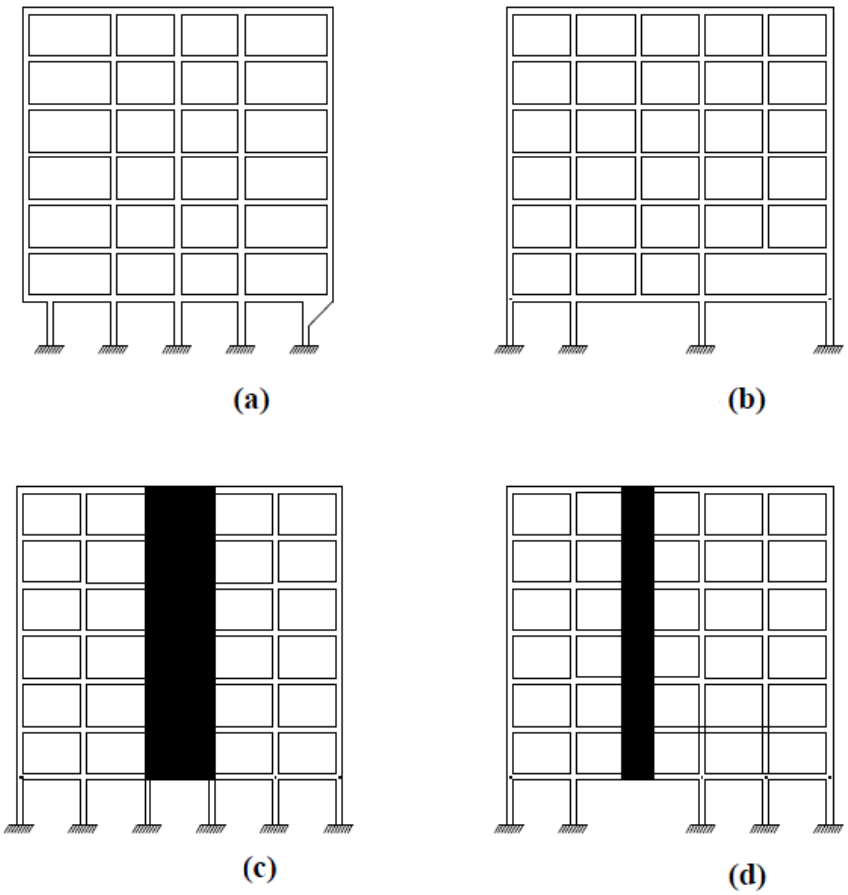


Figure 2.18: Discontinuity of Vertical Structural Elements Irregularity (Ministry of Public Works and Settlement, 2007, P.10)

2.3.2.2 Vertical Structural Elements' Elementary Design Faults

2.3.2.2.1 Broken Axis Columns

A broken axis column creates eccentricities and additional moments within the column, thus broken axis columns should be avoided during design stage. Interior broken axis column are not usually found as often as in exterior columns due to the desire of smooth façade. If smooth façade are desired when the cross-section of upper levels exterior columns are reduced, a plaster or masonry wall could be used to

fill the areas of reduced sections. However these fillings could be danger as it can fall off during earthquake motion if not installed properly. The centre line of a column should be continuous from foundation to roof to avoid any additional eccentricities and moments which may lead to cracks on structural members (Figure 2.19) (Ozmen and Unay, 2007).

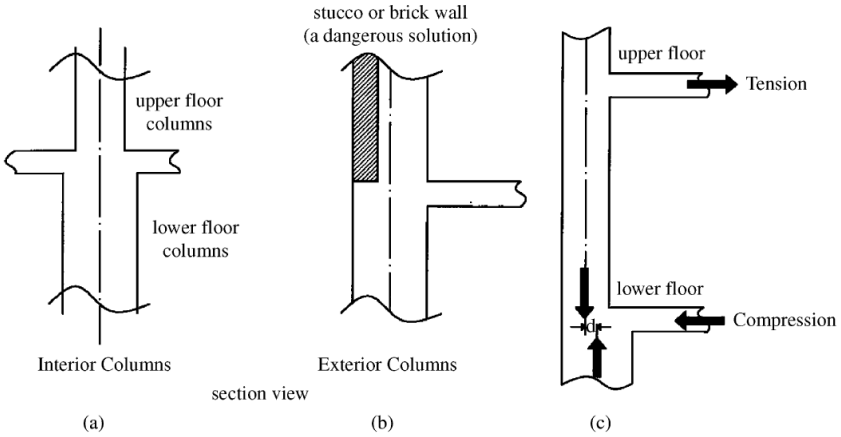


Figure 2.19: Broken Axis Columns (Ozmen and Unay, 2007)

2.3.2.2.2 Irregular Column and Shear-Wall Plan Configuration

Having Irregular column plan configuration will result in two elementary design faults about beams; namely: non-continuous beams and broken-axis beams (Figure 2.20a). As a result, critical torsion moments will be developed on the system under earthquake lateral inertia forces. Uneven deflections will develop due to varying rigidity throughout the diaphragm. Another disadvantage of irregular column plan configuration is that it requires uneconomical large cross-section structural element to compensate its lake of lateral resistivity. On the other hand, having a regular column plan configuration (Figure 2.20b) where column are regularly placed and organized according to an axial column grid system to resist X and Y earthquake

force directions, will result in even rigidity, limited deflections and reduced stresses on structural elements (Ozmen and Unay, 2007).

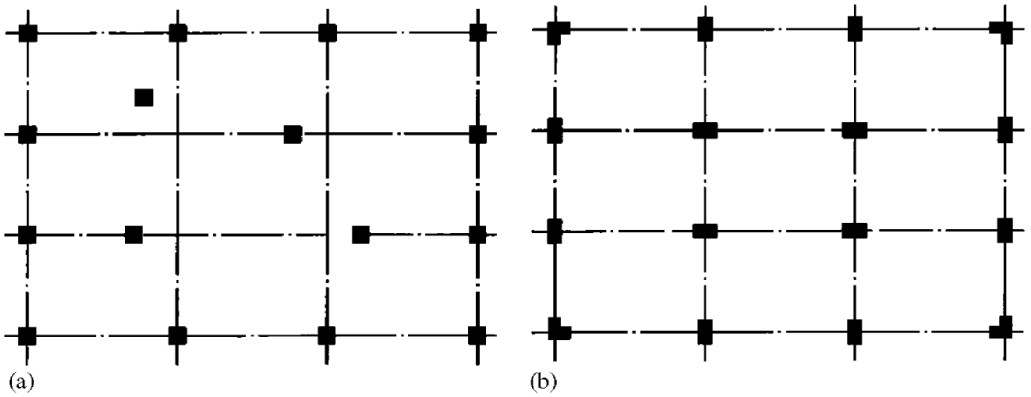
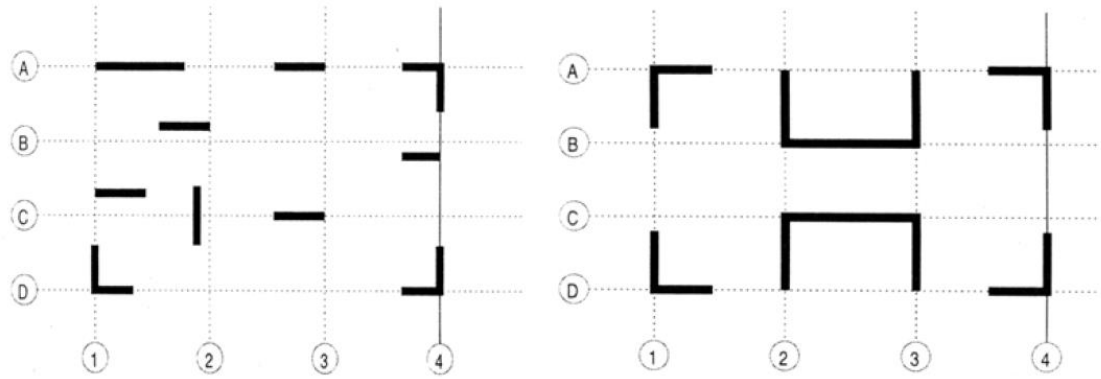


Figure 2.20: Irregular vs. Regular Configuration of Columns (ozmen and unay, 2007)

A shear-wall is a load-bearing wall having a longer edge to a shorter edge ratio >7. The minimum width of a shear-wall according to the 2007 Turkish Earthquake Code is 20 cm. Similar to columns, the configuration of shear-walls should be also regular by organizing them according to an axial grid system. Additionally, it is always preferable to distribute shear-walls symmetrically across the plan and evenly for X and Y directions (Figure 2.21). A shear wall have a high rigidity in the long direction which makes it very effective in reducing excessive deflections in that direction. Therefore, when using mix system of columns and shear-walls combination, it is best to place shear-walls parallel to the shorter edge of the building which is the direction of critical lateral earthquake force (Özmen, 2008).



A. **B.**

Figure 2.21: Irregular vs. Regular Configuration of Shear-Walls (Özmen, 2008)

2.3.2.3 Short Column

When the length of a column is reduced, its lateral rigidity increases which as a result attracts more lateral forces to it. Therefore short columns will be the first column to fail and in shear causing disasters during an earthquake. Short columns can occur in two scenarios:

I. Some columns are shorter than others within the structure.

II. Columns which most of their lengths are restricted from deflecting

Examples of the first short column scenario where some columns are shorter than others can be where columns are shortened by beams and in foundation columns on sloped topography (Figure 2.22).

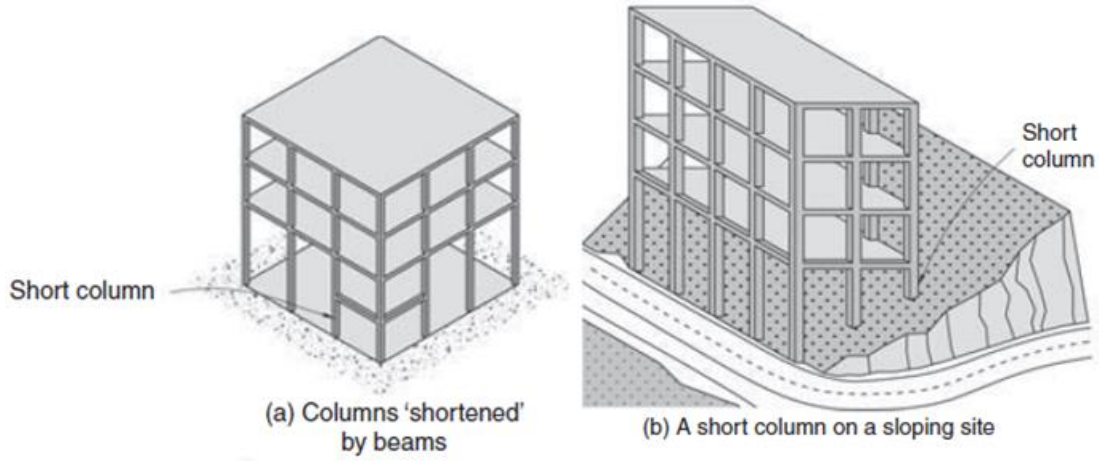


Figure 2.22: Examples of Short Columns Among Longer Columns (Charleson, 2008)

One way to overcome the type of short column problem shown in Figure 2.22a is to pin both ends of the beams that form short columns. However, this solution could generates a soft storey problem which must be considered. On the other hand, to overcome the problem of short columns on sloped site (Figure 2.22b), short columns can be lengthen and prevented from contacting the ground by sleeves or casings which allow the column to freely deflect (Figure 2.23). However, soft story could generate by this solution and should be checked.

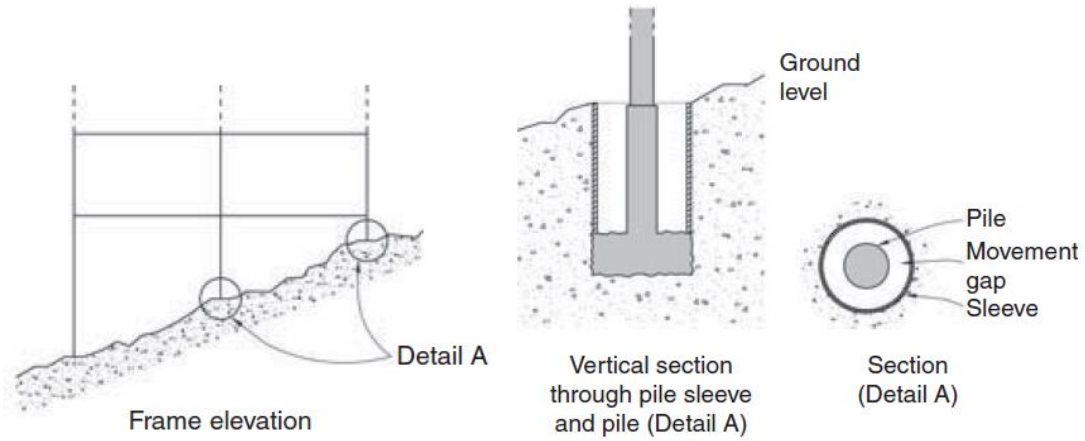


Figure 2.23: A Way to Overcome Short on Column on Sloped Site (Charleson, 2008)

In the second short column scenario where most of the column's length is restricted from deflection, columns are partially restricted usually by masonry infill walls (Figure 2.24). Masonry infill walls can intentionally or unintentionally act as shear-walls in buildings. Short columns are commonly caused by short masonry walls such as those found in parking buildings. Charleson (2008) mentioned the following rule-of-thumb on judging short columns: a column can be called a short column if the unrestricted length is less than twice its depth.

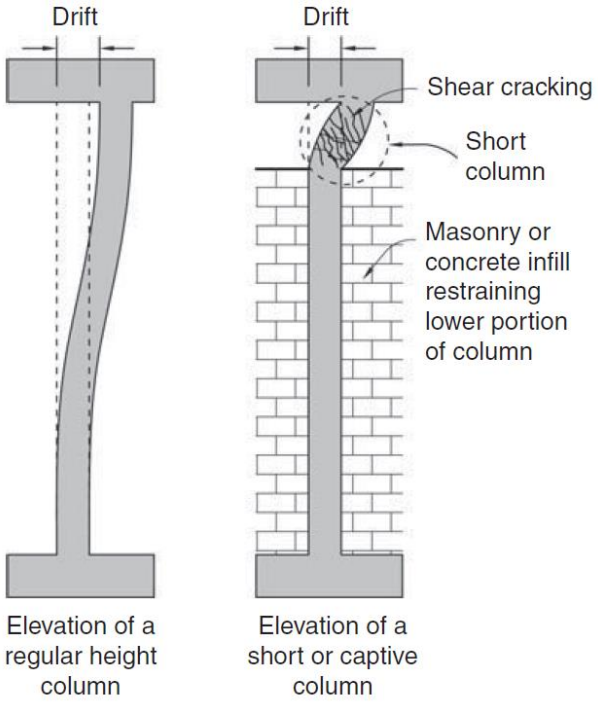


Figure 2.24: Short Column Occur When a Column is Partially Restricted from Deflecting Leading to Potential Damage in Form of Shear Cracking in the Unrestricted portion of the Column Under Lateral Force (Charleson, 2008)

To avoid the creation of short columns here, these short walls have to be isolated from the vertical structural elements using earthquake joints. Another method is illustrated in Figure 2.25. In this method, short column failure wouldn't occur because compression forces will act diagonally into the joint between column and beam (Charleson, 2008).

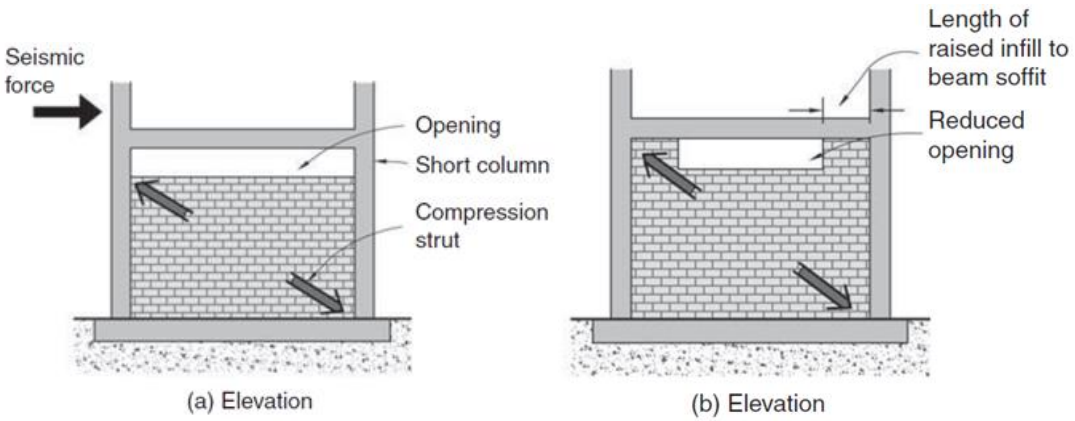


Figure 2.25: A Method of Avoiding Short Columns (Charleson, 2008)

Chapter 3

CONCRETE AND REINFORCED CONCRETE PROBLEMS

3.1 Introduction

Concrete does not always behave as desired; some of the undesirable defects can be seen as disintegration, spalling, cracking, leakage, wear, deflection or settlement. There are a combination of factors working together which contribute to concrete defects. These factors can be listed as: exposure conditions, service conditions, service load, construction, materials and design. The defects listed in this chapter can jeopardize the structural integrity and/or reduce the strength capacity of concrete. Thus, these defects can be categorised under structural defects as well.

In this chapter the following defects in concrete will be discussed together with their types, symptoms, causes, precautions, prevention, remedies and repair: corrosion of embedded meals, drying shrinkage cracks, construction defects, and structural cracks.

3.2 Corrosion of Metals Embedded in Concrete

Concrete is a high alkalinity material. A fresh concrete usually has a pH value between the range of 12 and 13. Within this range of alkalinity, a passive film is formed on the surface of steel embedded in concrete which protect it. Therefore, corrosion will start when this passive film is faded.

Corrosion rate is very slow in low permeable concrete (high quality concrete) because it is harder for water and oxygen to find their way to embedded steel which are the requirements for corrosion to initiate. However, the mistake of adding extra water to the concrete mix at construction sites is committed sometimes which increases the permeability of the concrete and thus increasing the chance of steel corrosion.

The ultimate structural load capacity of concrete members decreases as the percentage of corrosion increases due to reduction of bar diameter and cracking of concrete surrounding the embedded steel bar which may occur.

3.2.1 Accelerators of Corrosion

If the alkalinity (pH) is dropped (carbonation) or if aggressive chemicals or dissimilar metals are introduced into concrete, corrosion will be accelerated. Figure 3.1 shows the relationship between pH of concrete and corrosion rate. Corrosion of reinforcing bars is one of the most common building defect that can be found in the buildings of North Cyprus. The following subsections are the three accelerators of corrosion, namely: chlorides, carbonation and embedment of dissimilar metals.

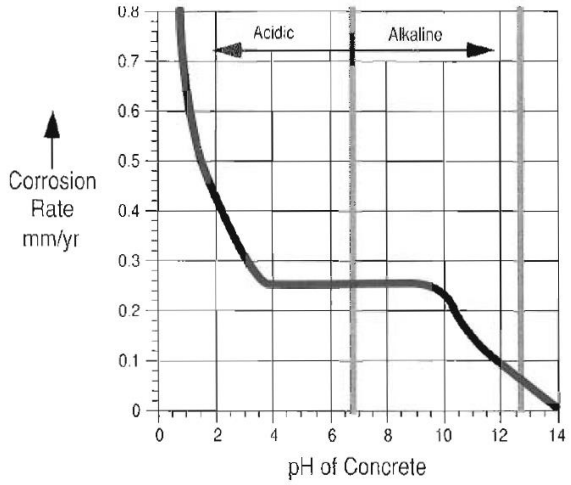


Figure 3.1: Relationship Between pH of Concrete and Corrosion Rate (Emmons, 1993)

3.2.1.1 Chlorides

Steel Corrosion could take place even if concrete is high alkaline when chlorides are present. Corrosion does not consume chlorides, they remain present in concrete because they only act as motivator to the process of corrosion (Emmons, 1993).

There are 3 ways for chlorides to be introduced into concrete:

a) By coming contacting environments that contain chlorides, like sea water or salts.

Chlorides penetration begins from surface, then moves inward. The rate of penetration time depends on: Chlorides amount contacting concrete, concrete permeability (durability) and available moisture amount.

When chlorides concentrations contact steel bars, corrosion occurs with the presence of moisture and oxygen. When the rust around steel grows and expands, tensile stresses will be developed and cause concrete to crack and delaminate. Those cracks and spalls accelerate corrosion as they evolve because they will make it easier for corrosive salts, oxygen, and moisture to access concrete. Deeper embedded steel bars will then be affected by corrosion.

Concentration level of chlorides necessary to promote corrosion decreases as the pH value of concrete decreases. Therefore it is easier for chlorides to promote corrosion as the alkalinity of concrete is lowering.

North Cyprus has a problem of high salt levels in its underground water. Therefore, when the water isolation is absent or inadequate, these is a good chance for corrosion

of reinforcing bars to start in the foundations reaching to the lower parts of the column causing cracks (Figure 3.2).

Figure 3.2: Corrosion Crack in the Lower Part of a Column. Mağusa, North Cyprus. (Case Study #1 (Page 93)).

b) Through existing cracks.

Cracks in concrete permits corrosive chemicals such as salts to enter the concrete and access embedded reinforcing steel bars easier. Table 3.1 presents tolerable crack widths in reinforced concrete according to ACI 224R-01.

Table 3.1: Tolerable Crack Widths in Reinforced Concrete According to ACI 224R-01

Exposure condition	**Tolerable crack width**	
	in	**mm**
Dry air or protective membrane	0.016	0.41
Humidity, moisture air, soil	0.012	0.30
De-icing chemicals	0.007	0.81
Seawater and seawater spray, wetting and drying	0.006	0.15
Water- retaining structure excluding non-pressure pipes	0.004	0.10

c) Cast-in chlorides.

Chlorides can be introduced intentionally to concrete during concrete mix stage as an accelerator, or in the form of natural ingredients found in some aggregates. Concrete made with beach sand or using seawater as mixing water will result in cast-in chlorides. Table 3.2 shows suggested chloride ion limits in concrete before concrete is placed in service according to ACI 201.2R-01.

Table 3.2: Suggested Chloride Ion Limits in Concrete Before Concrete Is Placed in Service According to ACI 201.2R-01

Service condition	**% of chloride ion to weight of cement**
Pre-stressed concrete	0.06
Conventionally reinforced concrete in a moist environment and exposed chloride	0.10
Conventionally reinforced concrete in a moist environment not exposed chloride	0.15
Above-ground building construction where concrete will stay dry	No limit

In old constructions of North Cyprus (buildings constructed more than 30-40 years ago) especially before 1974 water, sand and aggregate used in mixing concrete were mainly supplied from seawater and seashore. This is one of the most important reasons of corrosion in reinforced concrete and deterioration of RC buildings from that time. Figure 3.3 shows an old building constructed around 40 years ago suffering from corrosion-induced spalling due to cast-in chlorides in Palm Brach area in Mağusa, North Cyprus.

Figure 3.3: Corrosion-Induced Spalling and Cracking Due to Cast-in Chlorides in an Abundant Old Building. Palm Beach Area, Mağusa, North Cyprus.
(Case Study #23 (Page 115)).

3.2.1.2 Carbonation

The reaction between acidic gases in atmosphere and cement hydration products (calcium hydroxide dissolved in the pore water) is called carbonation. Normal air contains relatively low concentrations of carbon dioxide (0.03%). Industrial atmospheres contains higher level of carbon dioxide. Carbon dioxide penetrates into the pores of concrete by diffusion and existing cracks would help reducing the travel distance of carbonation. Carbonation reaction would result in reducing the alkalinity of concrete to a pH value of 10 which will lead to loss of concrete protection of the reinforcing steel. The passivity of the protective film on steel will be destroyed. If passive film of steel is lost and the concrete is acidic or mildly alkaline, corrosion will take place when moisture and oxygen are present in concrete. When the rust around steel grows and expands, tensile stresses will be developed and cause concrete to crack and delaminate.

In low permeable concrete (high quality concrete), carbonation is very slow (1mm/year). Besides, carbonation needs constant drying and wetting cycle, carbonation will not take place if concrete is constantly submerged under water (Emmons, 1993).

3.2.1.3 Embedment of Dissimilar Metals

Corrosion can occur in concrete when two different materials are cast into concrete structure, along with an adequate electrolyte (known as galvanic corrosion). A moist concrete matrix provides for a good electrolyte. Different metals promote different levels of electrochemical activity. Gold for example, is very active, while zinc is inactive, followings are some metals in order of increasing activity: zinc, aluminium, steel, iron, nickel, tin, lead, brass, copper, bronze, stainless steel and gold.

When two metals are in contact via an active electrolyte, the less active metal will be corroded. One of the most common examples found in buildings is the use of aluminium cast into reinforced concrete. Aluminium was used as an electrical conduit, and more recently, as hand rails. Aluminium has less activity than steel; therefore, the aluminium is the metal that corrodes. The steel will actually become cleaned, and the aluminium surfaces will grow a white oxide, which will cause tensile forces to crack the surrounding concrete. Figure 3.4 shows residential building's balconies having cracks due to dissimilar metal corrosion around handrail's embedded metal balusters.

Figure 3.4: Cracks Due to Dissimilar Metal Corrosion around Handrail's Embedded Metal Balusters of Balconies. Residential Building, Palm Beach, Mağusa, North Cyprus. (Case Study #24 (Page 116)).

3.2.2 Corrosion-Induced Cracking and Spalling

The following factors influencing concrete cracks and spalls due to corrosion of reinforcing steel bars: tensile strength of concrete, concrete cover quality, passive film condition, steel bar diameter, corrosion percentage. In order for spalling and delamination to occur, natural gravity force must act on loose concrete. As the cover-to-bar diameter ratio (C/D) increases the percentage of corrosion needed to cause cracking increases (Alsulaimani et al., 1990) (Figure 3.6).

Figure 3.5: Cracks and spalls in concrete short walls. Public structures, Mağusa, North Cyprus.

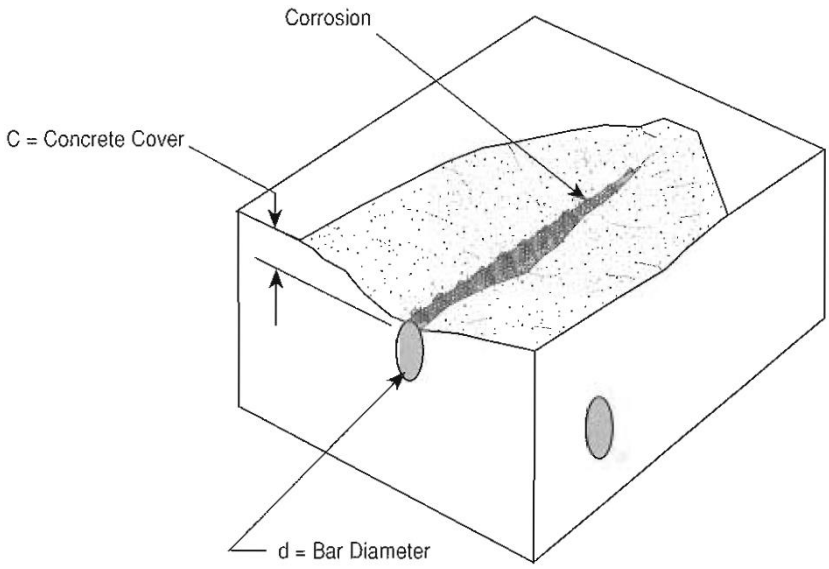


Figure 3.6: Corrosion-induced spalling (Emmons, 1993)

3.2.3 Precautions, Prevention, Remedies and Repair

3.2.3.1 Precautions and Prevention

The followings are methods for precautions and prevention of embedded metal corrosion in concrete:

1. Any permanent direct water at concrete surface or persistent water leakage should be dealt with and eliminated.
2. Deteriorative concrete caused by aging such as those of aged buildings should be cured.
3. Avoiding using salty water or/and seashore aggregate in concrete mix.
4. Cracks due to overloading should be dealt with immediately to avoid ease access of O_2 and H_2O to steel bars through cracks.
5. Precautions in handrail detailing, material selection and installation to avoid galvanic corrosion.
6. Adequate concrete cover above steel bars should be selected during design and detail stage. Besides, ensuring the proper execution of these details through adequate site supervision.
7. Water isolation should be properly installed and any defects in water isolation should be minimized. Besides, proper selection of water isolation type.
8. Minimizing the direct exposure of concrete to CO_2 to avoid reduction of concrete alkalinity (carbonation) especially in polluted cities and industrial areas.

3.2.3.2 Common Remedies and Repair Methods

3.2.3.2.1 Patch Repair

If the damage is limited within concrete only, like concrete cover spalling, but reinforcing bars are still considered fine, then this method is the most common repair method for such a situation. Loose concrete must be removed till reaching intact concrete bed. Then, the exposed area of rusty steel bars and concrete must be well cleaned and dust free. Otherwise, they won't bond properly with the patching up mortars. Before patching up, the cleaned exposed steel bars should be primed using special cement/epoxy based primer suitable for the patching up mortar. Finally, patch up using suitable repair mortars to cover and prevent rusting of reinforcement bars. There are 2 material types commonly used for ordinary patching up (Chin-man, 2002):

1) Cementitious mortars, e.g. cement mortar and polyester-modified cementitious mortar.
2) Resin-based mortars, e.g. epoxy resin mortar and polyester resin mortar.

3.2.3.2.2 Replacement of Reinforcement Bars

The addition or replacement of reinforcement steel bars method is applicable when the damage is more severe in a way, after cleaning out the rust, it is revealed that the steel bars have lost significant amount of its diameter. The specifications of the old reinforcement bars have to be identified before carrying on estimates on the needed steel bars replacement or addition and the needed lapping of the existing and introduced bars.

3.2.3.2.3 Strengthening by using Carbon Fiber Reinforced Polymer (CFRP)

After carrying out the proper repairs of cracks, spalls and corroded bars, structural members can be strengthened using Carbon Fiber Reinforced Polymer (CFRP)

which is one of the materials being used recently for strengthening of RC buildings in North Cyprus (Figure: 3.7). The old bazaar in İskele was also built around 40 years ago. The use of salty water and aggregate were the main reasons for the deterioration of the building and the corrosion of reinforcing bars in the structural members. This building is currently being repaired and strengthened by using CFRP. Also new columns and new foundations were introduced for proper strengthening of this old building (Naimi and Celikag, 2010).

Figure 3.7: Strengthening of the Old Bazaar by Using CFRP in İskele, North Cyprus (Naimi and Celikag, 2010)

3.3 Cracks Due to Drying Shrinkage (Cracks Due to Moisture Effect)

When exposed to air, concrete loses some of its original water by means of evaporation and shrinks as a result. Shrinkage cracks are commonly found on the floor screed surface and normally caused by improper curing process.

Drying shrinkage, if unrestrained, results in shortening of the member without a build-up of shrinkage stress. If the member is restrained from moving, stress build-up may exceed the tensile strength of the concrete. This over-stressing results in dry

shrinkage cracking. Shrinkage cracks are commonly found on the floor screed surface and normally caused by improper curing process. (Emmons, 1993) showed the factors affecting drying shrinkage in Table 3.3.

Table 3.3: Factors Affecting Drying Shrinkage (Emmons, 1993)

Factor	**Reduced Shrinkage**	**Increased shrinkage**
Cement type	Type I, II	Type III
Aggregate size	38 mm	19 mm
Aggregate type	quarts	sandstone
Cement content	325 (kg/m^3)	415 (kg/m^3)
Slump	76 mm	152 mm
Curing	7 days	3 days
Placement temperature	16°C	29°C
Aggregate state	washed	dirty

3.3.1 Precautions and Prevention

Correct placement of reinforcing steel in the member distributes the shrinkage stresses and controls crack widths. Adequate curing process must be insured to avoid drying shrinkages.

3.4 Construction Defects Due to Faulty Workmanship

Methods used to construct concrete structures are different from methods used in other type of construction. Concrete is one of the few materials in which raw ingredients are brought together at, or near, the construction site, where they are mixed, placed and moulded into final product. There are numerous variables influencing the production of concrete that there is a probability at all times for something to go wrong. Every building process includes a sequence of necessary step-by-step operations from conceptual plan to finished structure.

Mistakes can be classified into two groups: wrong detailing and inexperienced labourers. Errors can be committed at one or more of the following main stages: conceptual planning, design, construction, and maintenance. Sometimes, designers are not paying adequate attention and not giving importance to some of the construction and structural details at design stage which are essential for sufficient building design and preventing defective workmanship or wrong detailing and design errors. Furthermore, inadequacy of quality control and problems in workmanship due to shortage of experienced and skilled workers to perform construction works, which is the consequence of unusual increase in the demand of construction industry in recent years, lead to the poor construction quality in RC building construction in North Cyprus.

On the other hand, workmanship issues are always associated with small contractors as they are not well trained to be in the construction industries. In many cases their quality of works is low due to lacks of experiences and improper guidance from the relevant parties. Workmanship issue are less to arise among established contractors/suppliers as they have strong financial record and expertise in carrying the works. The local government should through various entities make efforts to improve knowledge and skill of those small contractors by conducting field training, seminar and short courses.

Unfortunately, inadequacy in supervision of the construction at the sites in North Cyprus is a main factor of construction defects. Buildings are constructed with insufficient site control. This causes various construction defects in the construction industry. Chambers of the architect and engineers could only carry out the project control on submitted paper work (Özbilen, 2004).

The following subsections are aimed to highlight the problems in RC structures that can be seen mostly in buildings under construction due to mainly wrong/inadequate detailing, lack of workmanship and vibration. Some of these faults are not recognized by the professionals or construction workers since over the years they are naturally being accepted as necessary applications and no body questions why a particular work is done in such away.

3.4.1 Improper Reinforcing Steel Placement

There are three important reasons to control the proper location of reinforcing steel in structures:

a) Steel bars are used in concrete to carry tensile loads, and if the steel is placed improperly, that might denies the concrete the ability to carry tensile loads. Cantilevered slabs, and negative moment areas near columns pose particular risk.

b) Steel bars needs sufficient concrete cover to prevent them from getting rusty. The alkalinity of the concrete is a natural corrosive inhibitor. If the concrete cover is inadequate, steel bars will be vulnerable to corrosion in short time (Figure 3.8 a). Shifted reinforcing bar cages in columns, walls or beams may also cause the reinforcing steel to lose proper cover as shown in Figure 3.9. The ACI-required concrete cover for corrosion protection is shown in Table 3.4.

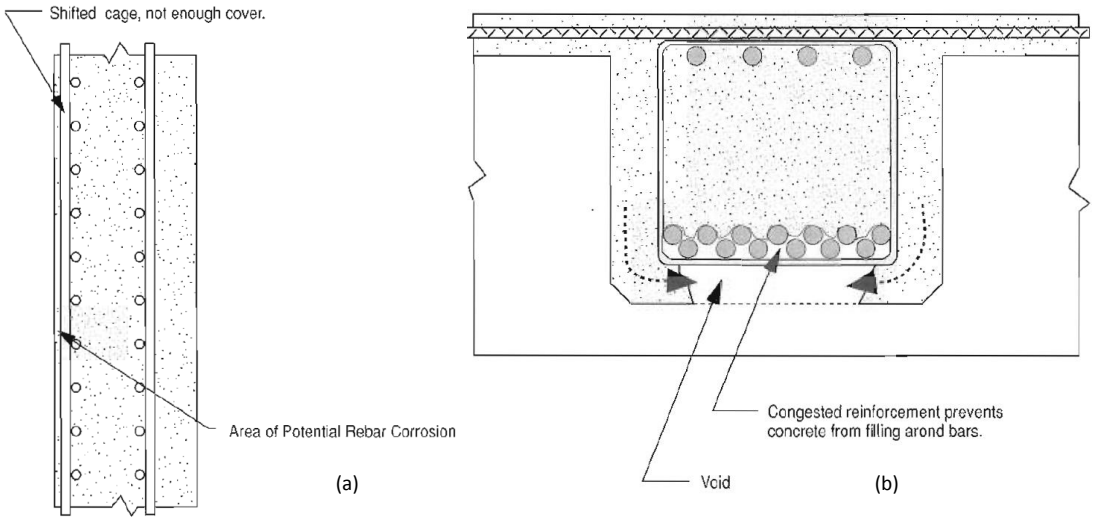


Figure 3.8: Illustrations of Improper Reinforcing Steel Placement: (a) Shifted Cage Causing Inadequate Concrete Cover. (b) Congested Reinforcement. (Emmons, 1993)

Figure 3.9: Shifted Reinforcing Bar Cages in: a Beam (a) and in a Sheer Wall (b). Residential Buildings, Mağusa, North Cyprus.
(Case Study #111 (Page 203)).

Table 3.4: ACI-Required Concrete Cover for Corrosion Protection

Condition	**Cover required (mm)**
Concrete deposited on the ground	76
Formed surfaces exposed to weather: bars > 19 mm	51
Formed surfaces exposed to weather: Bars < 16 mm	38
Formed surfaces not exposed to weather: Beams, girders, columns	38
Slabs, walls, joists: Bars < 36 mm	19
Slabs, walls, joists: Bars 43 mm, 57 mm	38

c) Beams and columns are usually heavily reinforced members. Lap splices require overlaps of bars and may result in a mat of steel that concrete mix cannot pass through during placement and consolidation. The result is either a visible, or worse, a latent void around the reinforcement (Figure 3.8b) and (Figure 3.10). High congested reinforcement should be reduced by taking it into consideration during design stage.

Figure 3.10: Visible Voids around Reinforcements Due to High Congestion.
Residential Building, Mağusa, North Cyprus.
(Case Study #104 (Psge 196)).

3.4.2 Premature Removal of Forms

Removal of forms (including shorting) before the concrete reaches a suitable strength may result in compression and tensile stresses, leading to cracks, deflection, and probable collapse (Figure 3.11).

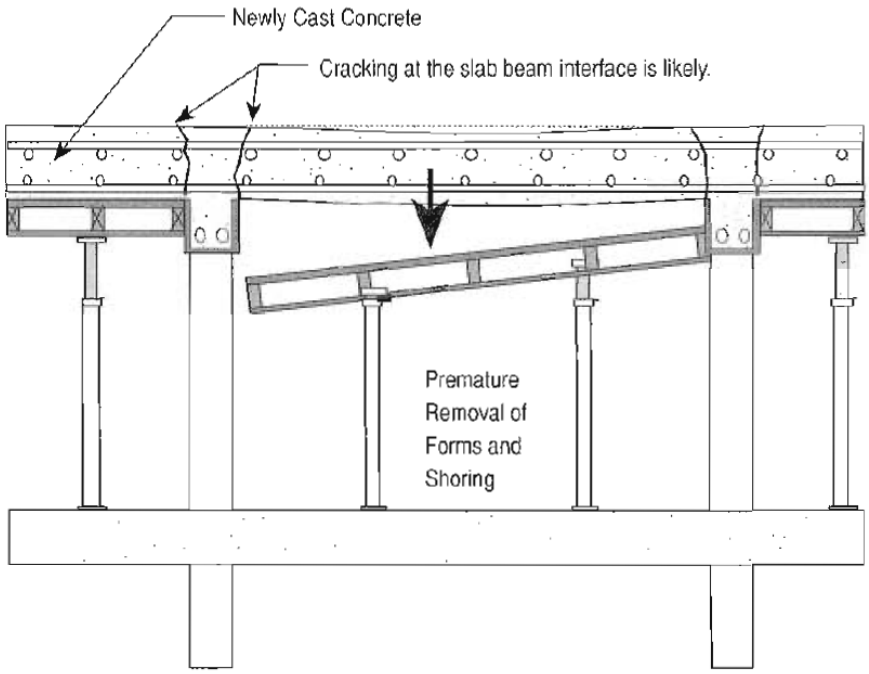


Figure 3.11: Illustration of Premature Removal of Forms (Emmons, 1993)

3.4.3 Cold Joints

Cold joints are regions of discontinuity within a member where concrete may not tightly bond to itself. Cold joints may occur within a planned placement if a part of concrete in one placement sets, and then the rest of the concrete is placed on it. During the set, laitances form, providing for a weakened plane. The result is a weak connection between placements that could rebuilt in weakness. To achieve proper bond and water-tightness, the surface of hardened concrete must be free of dirt, debris, and laitance. Figures 3.12 and 3.13 shows some cold joints in columns.

Figure 3.12: Cold Joints in Columns. Residential Buildings, Mağusa, North Cyprus. (Case Study #111 (Page 203)).

Figure 3.13: Cold Joint in Column. Residential Buildings, Mağusa, North Cyprus. (Case Study #104 (Page 196)).

Cold joints can also be found at intersections between members where timber is not properly removed from the reinforced concrete as shown in Figure 3.14. This can eases the initiation of corrosion in exposed bars which can lead to other serious problems during the building's lifespan.

Figure 3.14: Cold Joint Between Column and Slab. Residential Buildings, Mağusa, North Cyprus. (Case Study #111 (Page 203)).

3.4.4 Segregation

Segregation of concrete results in non-uniform distribution of its constituents (Figure 3.15). High slump mixes, incorrect methods of handling concrete and over-vibration are causes of this problem. Segregation causes upper surfaces to have excessive water-cement ratio. The resultant concrete may lack acceptable durability.

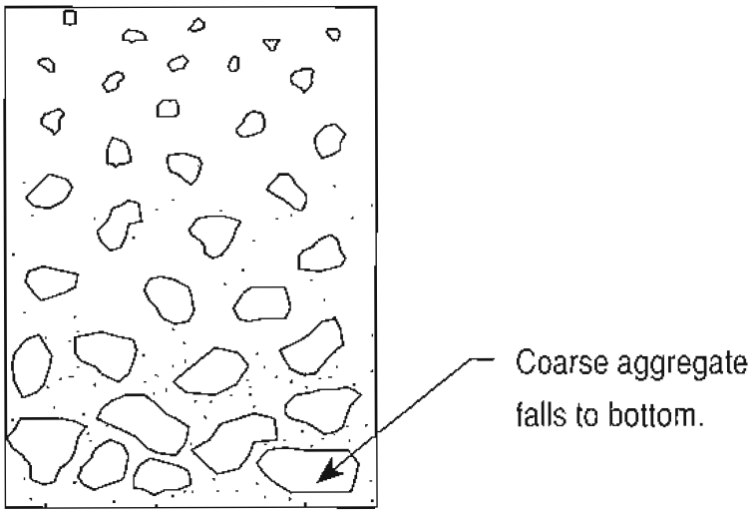


Figure 3.15: Illustration of Segregation (Emmons, 1993)

3.4.5 Honeycombing

Honeycomb is a void found in concrete because mortar has failed to fill the gaps between course aggregates (Figure 3.16). This air void creates a low compressive strength spot within the concrete member. Honeycombing occur mainly because of insufficient vibration of concrete during pouring. Excessive honeycombing in columns could result in a failure of the column under earthquake forces. Emmons (1993) summarized the primary causes of honeycomb in Table 3.5.

Figure 3.16: Honeycomb in a Column. Residential Building, Mağusa, North Cyprus. (Case Study #104 (Page 196)).

Honeycombing in concrete if not fixed can lead to water seepage which in return lead to: rust staining, paint/wallpaper peeling, water dripping, mouldiness and defective concrete, plaster or tiles (Chin-man, 2002).

Table 3.5: Primary Causes of Honeycomb

	Design of members	**Forms**	**Construction conditions**	**Properties of fresh concrete**	**Placement**	**Consolidation**
a	Highly congested reinforcement	Leaking at joints	Reinforcement too close to forms	Insufficient fines	Excessive free-fall	Vibrator too small
b	Narrow section	Sever grout loss	High temperature	Low workability	Excessive travel in forms	Frequency too low
c	Internal interference	-	Accessibility	Early stiffening	Lift that is too high	Amplitude too small
d	Reinforcement splices	-	-	Excessive mixing	Improper tremie or drop chute	Short immersion time
e	-	-	-	Aggregate that is too large	Segregation	Excessive spacing between insertion
f	-	-	-	-	-	Inadequate penetration

3.4.6 Improper Grades of Slab Surfaces

Slabs requiring drainage for proper runoff need special attention. Drains should be at low, not high points. Proper slop-to-pitch for quick runoff is important to prevent deterioration and leakage within the structure. Standing water provides concrete with the potential for saturation (Figure 3.17). The quicker the water runs off the structure, the less leakage can occur through joints and cracks.

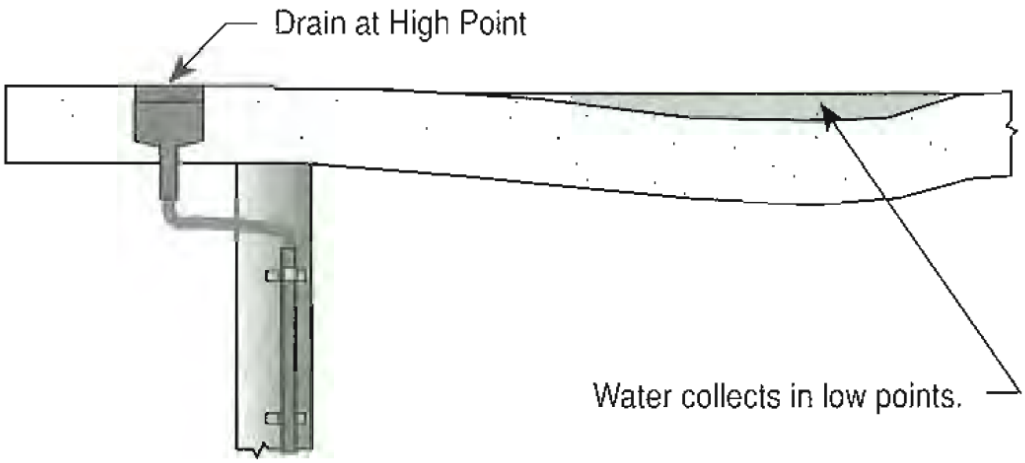


Figure 3.17: Improper Grades of Slab Surfaces (Emmons, 1993)

3.5 Cracks in RC Due to Load Effects (Structural Cracks)

Concrete structures and individual members all carry loads. Some carry only their own weight, while others carry loads applied to the structure. All materials change volume when subject to stress. Concrete is no exeption. Most concrete members are subject to tensile forces. Slabs and beams are the most common members subject to significant tension. When subject to tensile stress, concrete stretches; when subject to compressive stress, it shortens. Reinforced concrete is a structural composite made up of two types of materials: concrete and reinforcing steel. Concrete possesses high compressive strength but low tensile strength (about 10 percent of its compressive

strength), and reinforcing steel bars are placed in the concrete to provide the needed strength in tension. Steel and concrete work effectively togother in a composite material for several reasons:

1. Similar thermal expansion coefficient.
2. Rebar-concrete bond prevents slipping of rebars relative to the concrete.
3. Good quality concrete adequately protects reinforcing steel from corrosion.

Concrete problems, such as excessive deflection, cracking, or spalling may be caused by volume change associated with load effects. A simply supported beam with loading from top experiences tension in its bottom portion (maximum tension at midspan). While compressive forces are acting in the top portion (maximum compression at midspan).

When reinforcing bars are subjected to tension, they stretch. The concrete arround the reinforcing bars in consequently subject to tension and stretches. When tension in exces of tensile strength of concrete is reached, transverse cracks may appear near the reinforcing bars.

When structural cracks are observed, the building must be checked immediately by experts. Stuctural cracks mean the building or part of it is overstressed which may lead to a sudden collapse.

3.5.1 Slab/Beam-to-Column Shear (Punching Shear) Cracks

Column connections to slabs and beams experience considerable shear stress. Excessive stress produces cracks in the beams and in the surrounding slab (Figures 3.18 and 3.19).

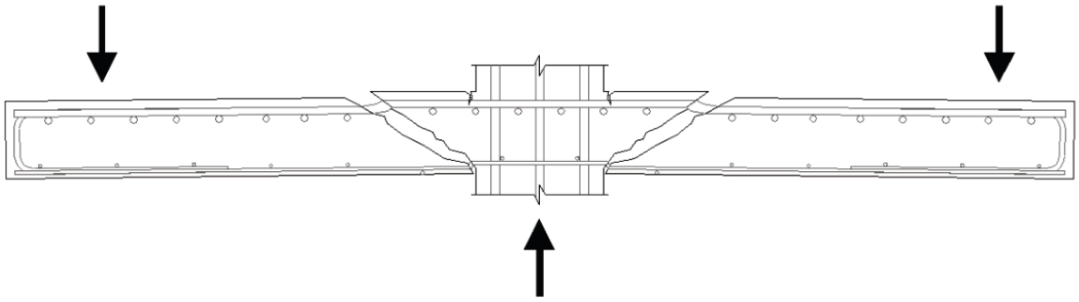


Figure 3.18: Illustration of Punching Shear (Sacramento et al., 2012, p. 594)

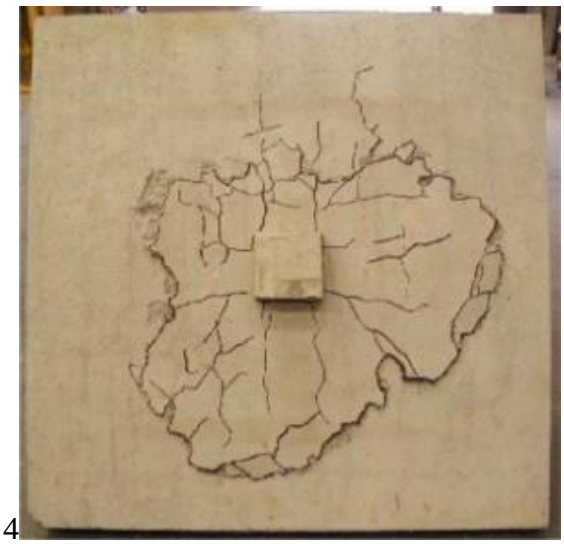
4 

Figure 3.19: Plan View of Punching Shear Cracks in a Test Specimen at University of Waterloo, Ontario. (Curtis, 2013)

Shear cracking at column-beam/slab connections can also be caused by horizontal movement. Horizontal forces can accumulate from: Volume changes caused by temperature changes and foundation movements caused by settlement or earthquakes.

In seismic/moment resisting frames, columns support beams (Figure 3.20a). These beams usually provide enough thickness to resist punching shear. However, some structures do not only consist of seismic/moment resisting frames, but a combination of seismic resisting frames and gravity only columns. These gravity only columns

support flat slabs directly, and here were the punching shear is in high concern (Figure 3.20b).

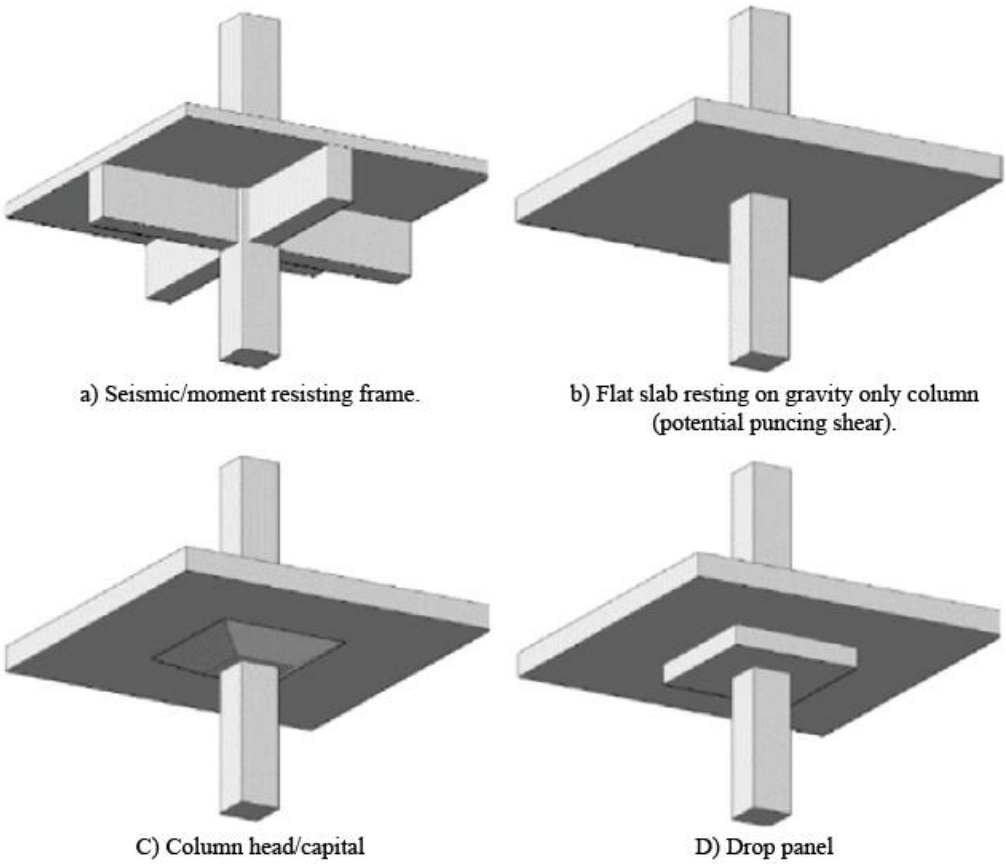


Figure 3.20: Some Methods of Increasing Punching Shear Resistance.

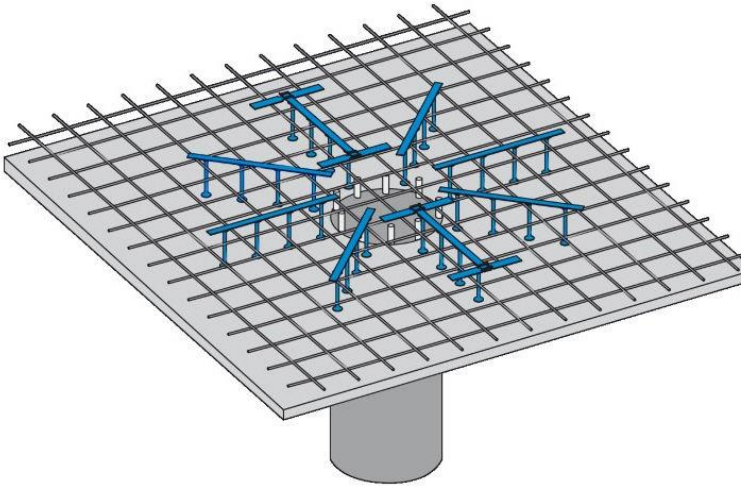


Figure 3.21: Punishing Shear Reinforcement
http://www.bpress.cn/ex/tag/PEIKKO/

3.5.1.1 Precautions and Prevention

There are several design methods to increase punching shear resistance. The simplest method is to increase the slab depth, yet it is the least economical method. It would be more economical to increase the depth of the slap in the column area only by providing column heads (capital) or/and drop panels (Figure 3.20c and d). Another method can be by playing with reinforcements, such as providing additional negative reinforcements, shear links or shear studs (Figure 3.21).

3.5.2 Cantilevered Members' Cracks

Cantilevered members are supported only on one side, balcony slabs are a typical example. Tension forces are acting in the member's top portion. Top portion tension is also known as negative moment. Tension is greatest at the member's fixed end. Tension forces are carried by the reinforcing steel located in the top portion of the member. Two critical factors should be considered when using cantilevered members:

1. The negative moment steel must be placed in the correct position near the member's top surface. Improper placement of the reinforcing steel may result in bending failure of a structural member.
2. Tension cracks that develop over the negative moment steel are natural canyons for moisture and other corrosion-inducing substances (Figure 3.22). Heavy corrosion results in section loss and causes proportional loss in tension capacity. Yielding of reinforcing steel may result in hinging and complete failure.

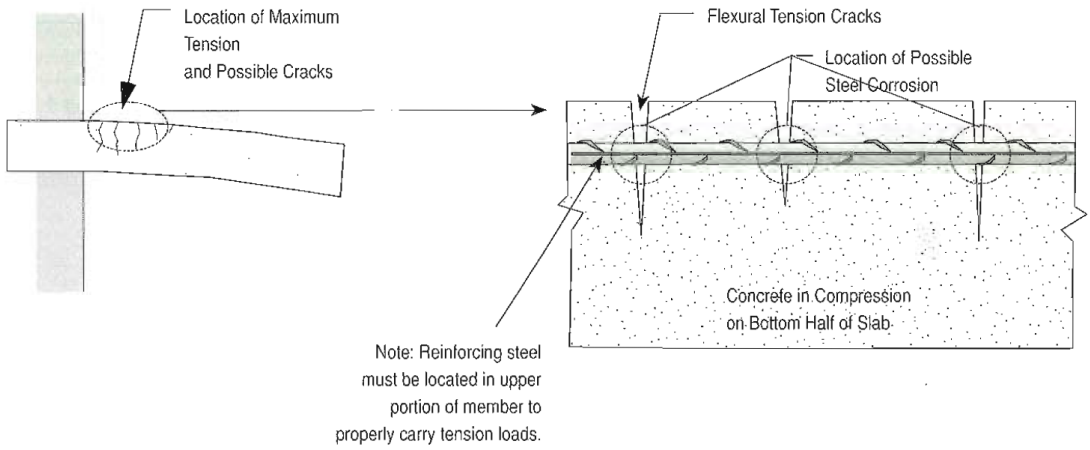


Figure 3.22: Illustration of Cracks in Cantilevered Slab (Emmons, 1993)

3.5.2.1 Precautions, Prevention, Remedies and Repair

3.5.2.1.1 Precautions and Prevention

Avoiding overloading and exceeding the designed strength capacity of the cantilevered member. Besides, care in designing and placing the reinforcement bars in their correct position on top to counteract negative moment.

3.5.2.1.2 Remedies and Repair

After the provision of temporarily external supports, the cracks are commonly repaired by carrying out pressure injection of non-shrinkage grout or epoxy resin or by open-up and refill/recast with concrete (Chin-man, 2002).

3.5.3 Problems and Cracks Associated with Foundation/Soil Settlement

When the soil underlying the building is inadequately compacted or when it get swollen or shrunk by the effect of water in some soil types such as clays, the building or part of it subsides by the help of its weight leading to structural cracks and other serious problems.

Soil settlement is critical to buildings and infrastructures. Settlements lead to structural movements and can be caused by the mistake of selecting wrong foundation types due to lake of soil investigation.

Unwanted ground settlements and excessive movement of the building structure can result in causing diagonal cracks at corners of openings such as windows and doors. Besides, long continuous crack across width of walls or/and possibly structural elements. Those cracks on external wall not just destroying finishes but actually penetrate all the way to the other side through the masonry wall or concrete member. If not fixed, they can lead to water seepage which in return lead to: rust staining, paint/wallpaper peeling, water dripping, mouldiness and defective concrete, plaster or tiles (Chin-man, 2002).

Earthquake codes specifies whether site specific soil investigation is to be carried or not. For example in the 2007 Turkish Earthquake Code, site specific soil investigation is mandatory only if:

I. The height of the building is more than 60m in the first and second seismic zone (see Table 2.1 to refer to seismic zones in North Cyprus).
II. Buildings with importance factor of 1.5 and 1.4 irrespective of height and seismic zones (highlighted in red in Table 3.6).

Worthy to mention, the chamber of civil engineers funded a project to create a macro map of soil baring capacity, soil liquefaction and settlement properties for Tuzla region which is located in Mağusa.

Table 3.6: Building Importance Factor (I) (Ministry of Public Works and Settlement, 2007, p.11)

Purpose of Occupancy or Type of Building	*Importance Factor (I)*
1. Buildings to be utilised after the earthquake and buildings containing hazardous materials **a)** Buildings required to be utilised immediately after the earthquake (Hospitals, dispensaries, health wards, fire fighting buildings and facilities, PTT and other telecommunication facilities, transportation stations and terminals, power generation and distribution facilities; governorate, county and municipality administration buildings, first aid and emergency planning stations) **b)** Buildings containing or storing toxic, explosive and flammable materials, etc.	1.5
2. Intensively and long-term occupied buildings and buildings preserving valuable goods **a)** Schools, other educational buildings and facilities, dormitories and hostels, military barracks, prisons, etc. **b)** Museums	1.4
3. Intensively but short-term occupied buildings Sport facilities, cinema, theatre and concert halls, etc.	1.2
4. Other buildings Buildings other than above-defined buildings. (Residential and office buildings, hotels, building-like industrial structures, etc.)	1.0

3.5.3.1 Precautions, Prevention, Remedies and Repair

3.5.3.1.1 Precautions and prevention

Soil investigation and compaction should be carried out properly and the foundation design is bases on the results of soil investigation. Construction work should not start on site without any soil investigation.

3.5.3.1.2 Remedies and repair

3.5.3.1.2.1 Soil settlement

Solving foundation settlement problem caused by problematic soils is difficult, expensive and often of limited effectiveness. Any solution must stabilize the water content of the soil beneath the building.

There are many remedial methods for soil settlement due to inadequate soil compaction, one of them is slab lifting method using special resin where risen is to be injected into the ground at various levels so that it mixes and improves the soil properties. It is much faster compare to other method despite its higher cost. Figure 2.23 shows the improvement before and after the treatment at Social Security Organisation (SOCSO) building in Penang, Malaysia.

Figure 2.23: Before (on the left) and After (on the right) the Treatment Using Resin Injection at Social Security Organisation (SOCSO) Building in Penang, Malaysia (Suffian, 2013).

3.5.3.1.2.2 Cracks

Crack on brick walls can be repaired easily with straight forward methods such as applying repair mortar / putty onto the affected area (for cracks < 3mm) together with suitable wire meshes provided the surface preparation is carried out in proper ways (Suffian, 2013).

On the other hand, structural cracks (cracks found on structural elements) deserve immediate attention. The cracks are commonly repaired by carrying out pressure injection of non-shrinkage grout or epoxy resin or by open-up and refill/recast with concrete (as Chin-man, 2002).

Chapter 4

NON-STRUCTURAL PROBLEMS

4.1 Introduction

Non-structural defects vary widely, ranging from finishing flaws, water or moisture problems, and deterioration of materials. They usually don't jeopardize the structural integrity of a building but may affect the aesthetics and may cause health and comfort problems. The following non-structural defects will be discussed in this chapter: dampness, crazing, map cracking, efflorescence, paint peeling, mouldiness, staining, waterproofing defects, joint cracks and wooden door defects.

4.2 Surface Defects

Façade finishes of buildings in north Cyprus are of aluminium cladding and most commonly plaster and paint.

4.2.1 Dampness

Many surface defects are observed as dampness, resulted from insufficient protection of exterior surfaces, inadequate or poor water insulation, or capillary action. Dampness is the presence of undesirable moisture in the building's walls or ceilings etc. This undesirable moisture can lead to discolouration, staining, degradation of finishes or mouldiness on the damp surface. There are several types of dampness depending of the source of the moisture. However, the most common types of dampness in buildings are: condensation, rising damp and rain penetration (Trotman et al., 2004).

Dampness does not only affect buildings but it can also affect the health of buildings' inhabitants, knows as sick building syndrome, as the unwanted moisture allows for growth and multiplication of microbes such as moulds, fungi and bacteria causing poor indoor air quality. Besides, dampness deteriorates and disintegrates materials into air causing indoor air pollution. The followings are the effects of dampness on buildings:

- It causes corrosion of metals.
- It deteriorates furniture and other various building materials, such as: wood, plaster and paint.
- It damages electric installations.
- It shortens the life-span of the building.
- It is visually unpleasant (stains and discolouration).
- It causes mouldiness and efflorescence, which will be discuses later in this chapter.

Condensation, which is damp from the air, is the type of dampness caused by high air humidity. Indoor activities such as cooking, bathing/showering, washing and drying dishes and cloths and even breathing emit moisture and vapour into air increasing the air humidity and if not ventilated the risk of condensation damp within a building. Condensation normally occurs in tropical climates and in winter as for condensation to happen warm vapour need to meet a colder surface. Condensation affect the performance of buildings and hence the liveability of interior areas. Condensation can allow for mould to grow creating black spots on walls or ceilings, and if left untreated, condensation can damage paint and plaster. Sassu and De Falco (2014) listed the primary causes of water condensation as follows:

• Inadequate air circulation and ventilation.

• Deficient thermal insulation (as in order for condensation to occur, warm vapour must meet colder surfaces).

• Thermal bridges.

• Prevention of wall breathing by External cladding.

• Insufficient drying time of newly constructed walls and floors before cladding.

To prevent and solve the damp problem of condensation, dehumidifier can be used, adequate insulation, heating and ventilation should be applied and moisture generation should be minimized (e.g. dry cloths outdoor instead of indoor).

Rising damp is the type of dampness where moisture from groundwater moves upwards through the pores in walls of basements and ground floors by capillary action. It occurs in old building where damp-proof course (DPC) is not installed or in case of modern buildings, when ground water bypass it or penetrate a defective DPC. The damp-proof course (DPC) is the line of black waterproofing material, usually seen between two rows of bricks about 150mm above ground level. If left untreated, rising damp can cause degradation and damage of skirting, crumbling of plaster, as well as peeling of paint and wallpaper on the lower section of the wall (usually not higher than 1.5m), often with wet patches. In rising dampness, mouldiness can only occur in the early stages as rising dampness brings with it salts that prevent the growth of moulds. To overcome rising damp:

- Firstly: moisture sources should be eliminated, methods of removing groundwater usually expensive and requires experts. Or prevent moisture from bridging and bypassing the DPC.

- Secondly: replacement or/and adequate installation of water proofing insulation should be applied, such as damp-proof course (DPC).
- Thirdly: re-plastering of the affected area.

Rain penetration is the type of dampness where rainwater makes its way into a wall or ceiling by leakage or even through the surface itself. Additionally, sometimes moving cars can splash rainwater into external walls of buildings adjacent to streets causing them to damp. Eaves and overhangs play an important role in protecting of external surfaces from getting damped by rainwater. Therefore pitched roof building, which usually have eaves acting as overhangs, performs better than flat roofs in the protection against rainwater. Modern building designs, which favours flat roofs, requires special attention in detailing efficient rainwater drainage system. Waterproofing specially in flat roofs is essential for preventing rainwater to access buildings. If the roof waterproofing membranes is defected or not well sealed at joints, such as the joints between the roof and external walls, there will be higher chance for dampness to occur. Traditional pitched roof design such as gabled or hipped roof doesn't only perform better than flat roof, but they also do not require as much attention in detailing waterproofing and drainage as for those in flat roofs since they simply allow the rainwater flow out of the building (Sassu and De Falco, 2014). Rain penetration causes discolouration, staining, mouldiness and efflorescence on walls (Figure 4.1). Designing roof and windows with sufficient eaves or overhangs can to some extends protect walls from rainwater. Defective roof guttering or deficient drainage system increases the change for rain penetration dampness to occur: when rainwater drainage system get blocked or fail, rainwater running down the walls may damage them, accelerating the deterioration of the facade.

Spills and leaks are another moisture sources witch often causes dampness. Dampness causes by leakage of defected pipes or frequent floor washing with too much water can be easily mistaken for rising damp, rain penetration or condensation (Figure 4.2). The first and most important step of treating any kind of dampness is to eliminate the moisture sources.

Figure 4.1: Dampness on the Upper Section of the Wall Due to Rain Penetration. Civil Engineering Department, Eastern Mediterranean University (EMU), Mağusa, North Cyprus.

Figure 4.2: Dampness on The Lower Part of Second Floor Walls Due to Wet Floors Caused by Frequent Floor Washing Using Too Much Water Which Can Be Mistaken Eeasily as Rising Damp. Akdeniz Gormitory, Eastern Mediterranean University (EMU), Mağusa, North Cyprus.

4.2.2 Surface Cracks on Wall Finishes

Sometimes multi-directional hair-line cracks develops on walls and sometimes accompanied with paint peeled off. They are mostly cosmetic shrinkage cracks developed within wall fishes such as plaster or other cement sand based rendering finishes. These cracks disturb the finishes and the wall's aesthetic only and doesn't usually lead to structural hazard as they do not penetrate down to the reinforced concrete structure. Besides they do not pose any safety concern. These cracks should be repaired by open-up and repair by mortar with the required key (Chin-man, 2002).

4.2.2.1 Crazing and Map or Pattern Cracking

Crazing appears on the surface as a net arrangement of hair-line cracks which doesn't penetrate a lot beyond the surface (rarely more than 3 mm deep). Crazing cracks encompass small concrete areas less than 50 mm (2 in.). The cause of crazing is minor surface shrinkage due to rapid surface drying of unhardened concrete due to low humidity, high air temperature, hot sun, or drying wind, either separately or in any combination. This drying at the surface causes the concrete at the surface to shrink at a faster rate than the concrete below causing stresses at the surface. Prevention of crazing lies in curing, curing should start as early as possible to stop rapid surface drying and lower the surface temperature specially when the temperature is high and the sun is out. The concrete should be protected against rapid changes in temperature and moisture wherever feasible.

Map/pattern cracking is similar to crazing, but the difference between crazing and map or pattern cracking is that the cracks of crazing are very fine and hard to notice unless when the concrete surface is allowed to dry after being wetted. While map/pattern cracking is more visible and its cracks encompass larger areas of concrete.

Another difference is that the cause of map cracking is not only because of surface drying shrinkage restrained by underlying concrete that shrinks less, but it can also be one of the followings non-common causes:

- Expansion due to alkali-silica reaction within the concrete (ASR). Alkalis in Portland cement combine with reactive silica in some aggregates to form a gel around the aggregate particles. The gel absorbs water, causing internal expansion of the concrete and map cracking. Crack widths usually are large, reaching 1⁄2 inch in severe instances.
- Restrained thermal contraction, particularly at early ages. This typically occurs in thick concrete sections with enough mass to develop significant heat during cement hydration. The surface cools and then tries to contract, but the interior concrete that hasn't yet cooled restrains it. Map cracking then occurs.

Other than early water loss prevention and early curing mentioned in the prevention of crazing, map cracking can also be prevented by considering ASR in mix design. In the case when placing a large mass of concrete, concrete temperature can be minimized by cooling or by reducing cement content, or by using insulation blankets so the concrete surface doesn't cool too rapidly while the interior is still hot.

Although, both types of cracks are not structurally serious (except for map cracking caused by one of the two non-common causes mentioned above), they are undesirable as they may be aesthetically unacceptable and they can collect dirt, besides could lead to paint peeling(Figure 4.3).

Figure 4.3: Map cracking on the Column of the Top Floor That Led to the fall of some of the Paint Cover. English Preparatory School, Eastern Mediterranean University, Mağusa, North Cyprus.

4.2.3 Efflorescence

Efflorescence is a whitish bleeding or deposit on concrete (Figure 4.4) and brick wall surfaces which occurs due to chemical reaction between chemicals in the wall materials and chemicals in the atmosphere prior to painting process. Another cause is when moisture dissolves the soluble salts in the wall material, this salt-water solution is then moved toward the surface by evaporation or hydrostatic pressure. Left on the surface, water then evaporates, leaving a salt deposit at the surface. Efflorescence is structurally harmless but it is visually unattractive.

Figure 4.4: Efflorescence on Concrete Surface.
http://www.docfoc.com/concrete-cast-in-place-flat-grey-efflorescence

4.2.3.1 Precautions, Prevention, Remedies and Repair

4.2.3.1.1 Precautions and Prevention

If one of the following components which cause efflorescence are absent, efflorescence will not occur: water, evaporation or salts. When mixing concrete avoid the use unwashed sand and aggregate. Sand should meet the requirements in the standard of the American Section of the International Association for Testing Materials ASTM C33. Besides, ensure the use clean water and avoid using seawater. Less permeable concrete is less prone to efflorescence and thus lower permeability is favoured.

4.2.3.1.2 Remedies and Repair

This problem can be resolved by determining and isolating or eliminating the source of moisture, completely removing the finishes and removing the salts on the affected surface by brushing and washing and then repainting in suitable condition (Suffian, 2013).

4.2.4 Paint Peeling

Paint is a common wall finishing in North Cyprus. Paint peeling is when paint losses its adhesion to the wall and curls or fall off, also known as delamination. Paint peeling affects the aesthetic of the building and if wall surface is wet, it can lead to fungal and mould growth unless the used paint type has the property to prevent them. As discussed earlier in dampness, one of the symptoms of dampness is peeling of paint. Other than moisture there are causes for paint peeling, the followings are the common reasons for paint peeling:

- Age of paint: as time passes, paint degrades and losses its adhesive bond strength with the wall. Bad weather and intense or prolonged exposure to UV lights can accelerate this process. This is why paint peeling is more often on exterior walls. Therefore, periodic maintenance is necessary.
- Applying paint on dirty, dusty, wet, too smooth/glossy or hot surfaces: theses reduces the adhesion of the paint.
- Incompatible paint: this is common when applying a new paint over an older one without checking the compatibility between them which can cause the newer one separating off the older one, known as intercoat peeling.
- Moisture and damp Walls (most common cause): Moisture transmission through a wall forces off the paint.
- Using cheap/poor quality paint.

- Poor workmanship, such as: presence of trapped air, application of thick paint coat and un-dried undercoat.

4.2.4.1 Remedies and Repair

To solve the problem of paint peeling on a wall, the loose paint must be removed and surface roughed and sanded before dust removal and cleaning prior to repainting under a good condition with a compatible good quality paint.

4.2.5 Mouldiness

Mouldiness in houses is where surfaces such as walls and ceilings are covered with moulds which have grown on them. As discussed earlier in dampness, mouldiness can be caused by dampness, especially condensation. Mould spores are always present in the air and they are invisible to the naked eye. However, they become apparent when they land on a surface and start multiplying. To achieve that, moulds need four elements: food, moisture, a suitable temperature (between 2 and 40 degrees Celsius) and oxygen. At houses, oxygen is available always naturally in the air and the temperature usually is suitable. Moisture is offered by condensation and food (starch) is usually obtained from surface finishes such as wallpaper or emulsion paint and from ceiling tiles. Of these four things, we can only control mould growth by cutting out moisture or cutting out their food by using other wall finishing materials that prevent mouldiness such as anti-mould paint. The longer the material is exposed to water, the higher the risk of mouldiness. The quantity of water is not as important as the duration of exposure for moulds to grow.

Mouldiness affect the aesthetic appearance and causes stains or discolouration to the surface finishing material. Besides, the presence of moulds in the interior is

unhealthy and can cause health problems. Hence, it should be dealt with as early as possible.

4.2.5.1 Precautions, Prevention, Remedies and Repair

4.2.5.1.1 Precautions and Prevention

Preventing moisture from reaching surfaces and using wall finishing materials that prevent mouldiness such as anti-mould paint.

4.2.5.1.2 Remedies and Repair

The first and most important step in treating mouldiness is to eliminate the source of the dampness (refer to dampness section). Light mould staining on hard surfaces such as painted walls can be removes using a solution of water and vinegar, otherwise wipe down the walls with a fungicidal wash or diluted bleach. The final step is repainting with a good quality fungicidal paint to help prevent mould recurring.

4.2.6 Staining

After few years of painting, many building facades experiences staining problems such as water mark, rust marks, existence of moss, fungus and algae attacks, etc.

4.2.6.1 Precautions and Prevention

To minimize these problems, high quality external paint containing antifungals agents can be used. It may not offer a total solution but it helps to prolong a good appearance of the buildings.

4.3 Waterproofing Defects, Water Leakage and Seepage

To suit a modern concept of design and ease of maintenance, many building designers in North Cyprus have opted for a flat roof concept rather than traditional pitched roof. However, the problem that mostly associates with the flat roof is a

waterproofing-related issues. Flat roofs are usually more vulnerable to leakage problems compare to that of pitched roof (Douglas and Ransom, 2006).

There are numerous waterproofing systems that are used around the world, such as; liquid, bituminous membrane and cementations water proofing system. There are two techniques of applying waterproofing materials: liquid-application and membrane-application. Some waterproofing materials are able to withstand exposure to atmosphere and others need to be covered with finishes like cement sand screeding or tiles. Some materials are more elastic and suitable for anticipated movements in the roof structure. Waterproofing materials have life expectancy starting from of 5 years to more than 20 years.

Tests need to be performed after applying waterproofing to check its performance. Some water proofing test examples: flooding/ponding tests and thermal scanning

According to a study done by (Suffian, 2013) on Buildings in Malaysia, the bituminous membrane caused regular problem which its root causes was identified as follows:

- The burning process of membrane was not properly carried out resulting weak bonding to the substrates. Water may have tracked between the membrane and the slab thus makes it difficult to trace the source of the leak (Figure 4.5).
- No screed to protect the membrane from punching forces.
- Failure to repair minor defects at early stage that escalated to become major.

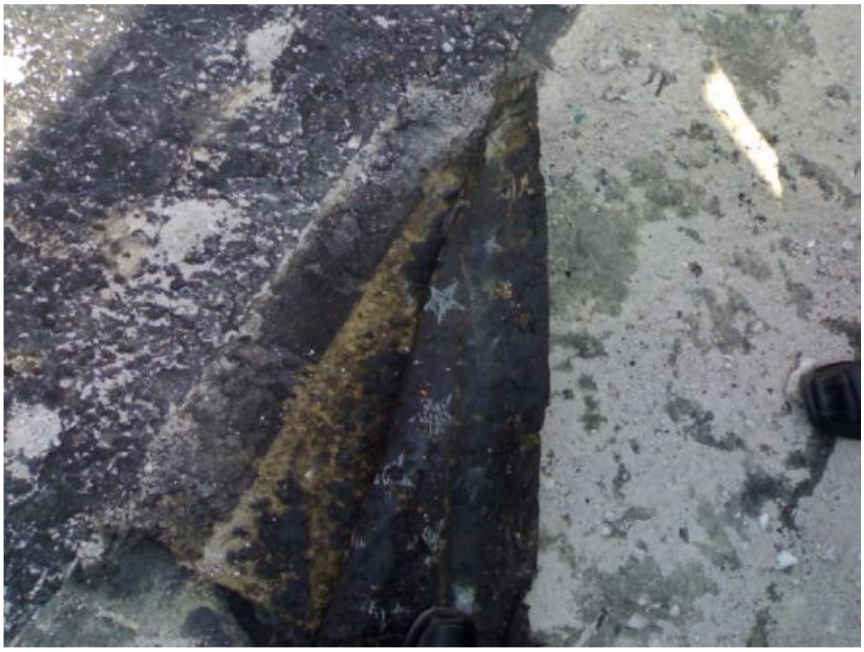


Figure 4.5. Failed Torch-on Membrane at Social Security Organisation (SOCSO) in Seberang Jaya, Malaysia (Suffian, 2013).

Suffian (2013) shows that increasing the thickness of membrane from 3 mm to 4 mm makes it performs better. The reason being that the burning process is more stable and easier resulting better bond to the slab.

Defective waterproofing can lead to water seepage which in return lead to: rust staining, paint/wallpaper peeling, water dripping, mouldiness and defective concrete, plaster or tiles (Chin-man, 2002).

4.3.1 Precautions, Prevention, Remedies and Repair

4.3.1.1 Precautions and Prevention

Some problems can be avoided much at early stage if the installer strictly follows the instruction such as constructing angle fillet at corners, fully cleaned the substrate surface prior to installation, accurately mixed components, etc. Installing waterproofing requires special attention to workmanship:

- To avoid ponding on roofs, waterproofed surfaces must have adequate slopping surface to allow for water to run off and find its way to drainage.
- Attention must be paid to the thickness of the applied waterproofing. If the thickness is for some reason is less that intended, problems might arise.
- Attention must be paid to overlapping the water proofing membranes at their edges.
- Corners are potential areas of problems. Therefore waterproofing material must be upturned and downturned where necessary such as walls, pipes and drain holes.
- When installing machines on roofs, attention must be paid to avoid excessive movement which can damage waterproofing integrity.

4.3.1.2 Remedies and Repair

4.3.1.2.1 Repair of Water Leakage in Roof

When it comes to repairing roof leakage problems, the easiest way is to totally replace the old or damaged waterproofing material. On the other hand, partial patch repair has some limitations and it has a higher probability to fail than the total replacement method. Partial patch repair can be applicable only if the source of the leakage such as

Partial application of waterproofing materials may be effective provided that the source of leakage such as cuts and holes can be precisely located, and the new material is compatible with the old one for effective bonding. Additionally, attention must be paid for sufficient overlapping and gradient of the surface to allow for water to run off and prevent ponding.

There are some temporary leakage repair technique which can be applied from ceilings, such as the use of chemical additives to existing concrete surfaces or chemical injection into the cracks and voids. These temporary leakage repair technique are applicable in apartments when the residents of the apartment above are not cooperative. These repair leakage methods can be applied as temporary solution only as water will still leak through other weak points.

4.3.1.2.2 Repair of Water Leakage in External Walls

Water can leak through external walls because of one or more of the followings:

- Penetrating cracks.
- Concrete defects such as honeycombing.
- Defects or loss of external finishes which protect the wall from the rain.

Common repair techniques:

- Penetrating cracks are either chemically injected or opened up before being repaired using waterproofing mortar.
- Honeycombing is cleaned before being patched using compatible waterproofing mortar.

Repairs can be applied internally or externally, depending on the location of the problem. After the repair is done, the surface can be smoothened, plastered and covered with finishes matching the existing ones. Special additives to the repair mortar or rendering can be used to improve waterproofing capabilities.

4.4 Non-Structural Cracks

4.4.1 Joint Cracks

Joint cracks are commonly seen at the joint between column or beams and infill walls. The common causes of such cracks are identified due to the difference thickness of plastering, insufficient bonding element that holds bricks to the column or beams and thermal movement.

4.4.1.1 Remedies and Repair

These cracks should be repaired by injection of specially designed chemicals (Chin-man, 2002).

4.5 Wooden Door Defects

Sometime the door frame and leaf of the toilet and other wet areas is found to be darkened in colour and fine dust of wood falls out of them on the floor. This symptom indicates termite attacks. Soft or damp timber attracts termites. This phenomenon happens when timber is dampened due leakage or insufficient floor tiles slope which allows water to travel to or near the door.

4.5.1 Remedies and Repair

A pest control professionals should be appointed to check and treat the problem. Infected wooden doors must be disposed (Chin-man, 2002).

Chapter 5

CASE STUDIES

5.1 Introduction

In order to highlight defects and inadequacies of design and construction in North Cyprus, numerous case studies were visited and data was collected about the types of defects and mistakes done. The priority of this investigation is to mainly identify the construction inadequacies, design faults, defects of structural members and non-structural members as well such as walls, finishes, insulations etc.

5.2 Methodology

There are a total of 125 case studies in this thesis divided into two groups. The first group which represents completed buildings contains 100 case studies divided into 25 case studies for each of the following four districts: Mağusa, İskele, Lefkoşa and Girne. The second group contains 25 case studies and represents uncompleted buildings, i.e., buildings under construction. The reason for dividing case studies into two groups is because it is easier to detect and consider seismic design faults for buildings which are not completed, i.e., buildings under construction. Case studies in this thesis were coded by using a letter followed by sequence number. For example, Mağusa case studies are M1-M25, İskele İ1- İ25, Lefkoşa L1-L25, Girne G1-G25 and for under construction buildings are C1-C25.

Upon visiting a case studies, visual inspection was carried merely by naked eye. Observation of defects and problems then were checked into a prepared checklist

(Check Appendix A for checklist sample) and documented by photographs when possible. The camera used for photographs is Nikon D5300 which has a built-in GPS, so the coordinates of each case study is recorded as well. The case studies were chosen randomly from noticeably defected buildings while driving, cycling or walking around the country. The location information, i.e., coordinates were extracted using ViewNX 2 software program. Using the coordinates, area and street names are determined through Google maps. Aided by the registered coordinates, the approximate age of the building are determined as well by using Google Earth software program which contain a set of historical imaginary satellite maps dating as far as 2003 (Note the age is approximate as there are missing maps such as those of the years between 2003-3008). If the building age is less than 14 years old, then the approximate age is determined by using Google Earth software program. However if it is more than 14 years old, there is no way to know the age of the building if not told by the owners of the buildings. Moreover, some of the 43+ years old building can be determined easily from the construction methods and materials used such as uncrushed aggregates (note that 43 is the age of the conflict of Cyprus).

5.3 Challenges and Limitations

- Most of the buildings were inspected exteriorly only as it is very difficult to inspect each of them interiorly.
- Without the provision of floor plans, elevations and detailed drawings, calculations to precisely determine irregularities cannot be carried. Visual determination of potential seismic design fault can only be possible if the building is under construction and in its skeleton form.
- Some of dampness defects are seasonal defects which occur mainly in winter. Crazing on the other hand is a surface defect which hard to detect unless if

the surface is allowed to dry after being wet, e.g. by rain. However, sometimes they leave evidences behind them which lead to their determination such as discoloration, stains and paint peeling.

5.4 Case Studies

Case Study #1 (M1)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Salamis Yolu		
Latitude:	N 35°8.789' (35°8'47.3")		
Longitude:	E 33°54.630' (33°54'37.8")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Case Study #2 (M2)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Salamis Yolu		
Latitude:	N 35°9.068' (35°9'4.1")		
Longitude:	E 33°54.408' (33°54'24.5")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		■
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #3 (M3)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Salamis Yolu		
Latitude:	N 35°9.137' (35°9'8.2")		
Longitude:	E 33°54.365' (33°54'21.9")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #4 (M4)

Profile

District:	Mağusa
Area:	Sakarya
Street name:	Tül Sk
Latitude:	N 35°9.134' (35°9'8.1")
Longitude:	E 33°54.274' (33°54'16.5")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #5 (M5)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Hüdoğanlur Sk		
Latitude:	N 35°9.188' (35°9'11.3")		
Longitude:	E 33°54.210' (33°54'12.6")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #6 (M6)

Profile

District:	Mağusa
Area:	Gazimağusa Sanayi Bölgesi (Famagusta Greater Industrial Area)
Street name:	Yeni Hastane Yolu
Latitude:	N 35°8.899' (35°8'53.9")
Longitude:	E 33°53.905' (33°53'54.3")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

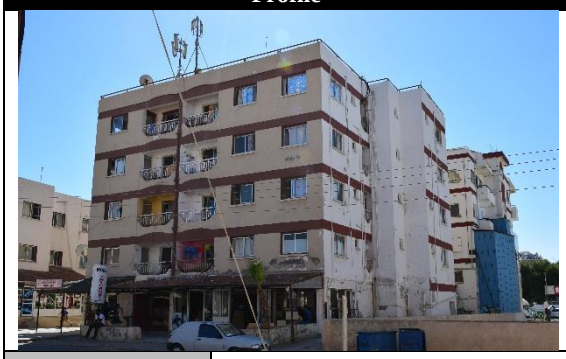
Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

The building is used as storage

Case Study #7 (M7)

Profile



District:	Mağusa		
Area:	Karakol		
Street name:	Başbuğ Sk		
Latitude:	35° 7'56.18"N		
Longitude:	33°55'31.13"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #8 (M8)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	Başbuğ Sk		
Latitude:	35° 7'55.46"N		
Longitude:	33°55'32.21"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #9 (M9)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	Fadıl Rıza Sk		
Latitude:	N 35°7.980' (35°7'58.8")		
Longitude:	E 33°55.613' (33°55'36.8")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Martı Apt. NO 11

Case Study #10 (M10)

Profile

District:	Mağusa
Area:	Karakol
Street name:	Fadıl Rıza Sk
Latitude:	N 35°7.954' (35°7'57.3")
Longitude:	E 33°55.584' (33°55'35.0")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #11 (M11)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	Fadıl Rıza Sk		
Latitude:	N 35°7.975' (35°7'58.5")		
Longitude:	E 33°55.664' (33°55'39.8")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #12 (M12)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	Zümrüt Sk		
Latitude:	N 35°7.903' (35°7'54.2")		
Longitude:	E 33°55.837' (33°55'50.2")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

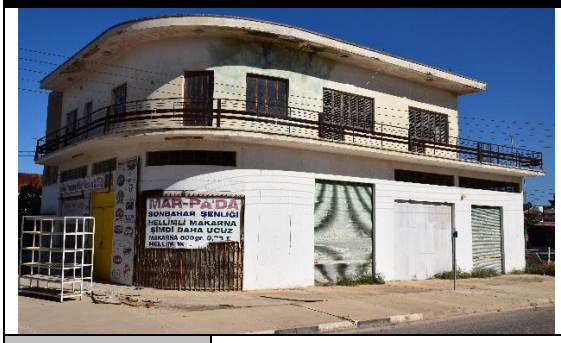
Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #13 (M13)

Profile



District:	Mağusa		
Area:	Piyale Paşa		
Street name:	On Beş Ağustos Blv		
Latitude:	35° 6'43.70"N		
Longitude:	33°55'29.62"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #14 (M14)

Profile

District:	Mağusa		
Area:	Namık Kemal		
Street name:	İker Karter Cd		
Latitude:	35° 7'0.46"N		
Longitude:	33°56'42.80"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #15 (M15)

Profile

District:	Mağusa		
Area:	Namık Kemal		
Street name:	İker Karter Cd		
Latitude:	35° 6'59.31"N		
Longitude:	33°56'43.25"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				■
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		
		Map/pattern cracking		
	Efflorescence			
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #16 (M16)

Profile

District:	Mağusa
Area:	Suriçi
Street name:	Kişla Yolu Sk
Latitude:	N 35°7.511' (35°7'30.7")
Longitude:	E 33°56.462' (33°56'27.7")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #17 (M17)

Profile

District:	Mağusa
Area:	Baykal
Street name:	Erbil Çetin Sk
Latitude:	N 35°7.179' (35°7'10.7")
Longitude:	E 33°56.017' (33°56'1.0")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

The building is for sale

Case Study #18 (M18)

Profile

District:	Mağusa
Area:	Baykal
Street name:	Mustafa Kurtuluş Sk
Latitude:	N 35°7.236' (35°7'14.2")
Longitude:	E 33°56.088' (33°56'5.3")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #19 (M19)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Gazi Mustafa Kemal Blv		
Latitude:	N 35°8.452' (35°8'27.1")		
Longitude:	E 33°54.524' (33°54'31.4")		
Structure age:	<14 years	Date (if available): ~ 2008	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	■
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #20 (M20)

Profile

District:	Mağusa
Area:	Sakarya
Street name:	Köroğlu Sk
Latitude:	35° 8'7.64"N
Longitude:	33°55'1.04"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment ■
	Residential — House
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

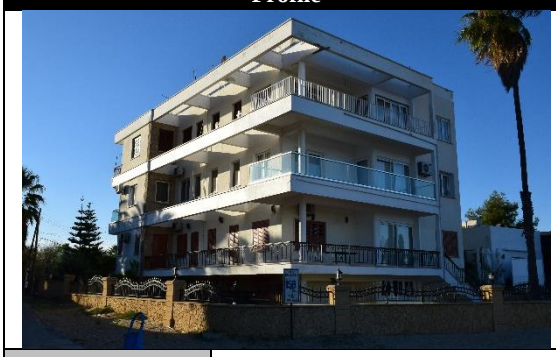
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #21 (M21)

Profile



District:	Mağusa
Area:	Namık Kemal
Street name:	Nadir Sk
Latitude:	35° 7'6.88"N
Longitude:	33°57'27.49"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #22 (M22)

Profile

District:	Mağusa		
Area:	Namık Kemal		
Street name:	Nadir Sk		
Latitude:	35° 7'8.49"N		
Longitude:	33°57'25.28"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

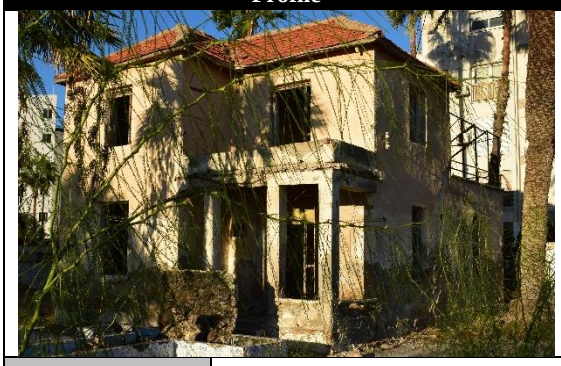
Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #23 (M23)

Profile



District:	Mağusa		
Area:	Namık Kemal		
Street name:	Nadir Sk		
Latitude:	35° 7'12.76"N		
Longitude:	33°57'25.79"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

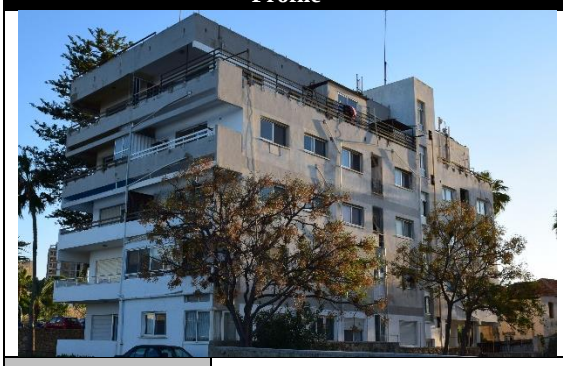
Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

The structural system of this house is mixed between loadbearing walls and reinforced concrete frames.

Case Study #24 (M24)

Profile



District:	Mağusa		
Area:	Namık Kemal		
Street name:	Palmiye Sk		
Latitude:	35° 7'13.15"N		
Longitude:	33°57'27.01"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #25 (M25)

Profile

District:	Mağusa		
Area:	Namık Kemal		
Street name:	Nadir Sk		
Latitude:	35° 7'15.09"N		
Longitude:	33°57'24.80"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	■
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #26 (İ1)

Profile

District:	İskele		
Area:	Long Beach		
Street name:	Gazimağusa-Karpaz Anayolu		
Latitude:	N 35°14.872' (35°14'52.3")		
Longitude:	E 33°53.879' (33°53'52.8")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

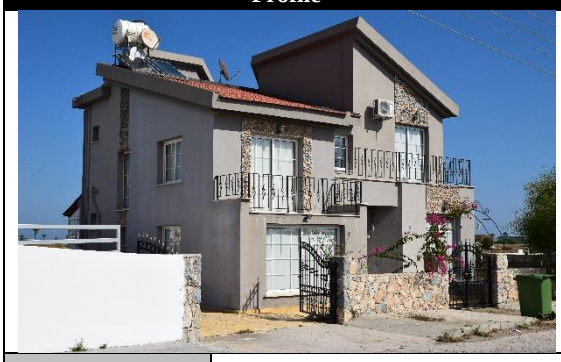
Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Rain penetration in this case is evident on the terrace which acts as a flat roof (not the pitched roof)

Case Study #27 (İ2)

Profile



District:	İskele		
Area:	Long Beach		
Street name:	Gazimağusa-Karpaz Anayolu		
Latitude:	35°14'52.66"N		
Longitude:	33°53'55.49"E		
Structure age:	<14 years	Date (if available): Early 2008	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

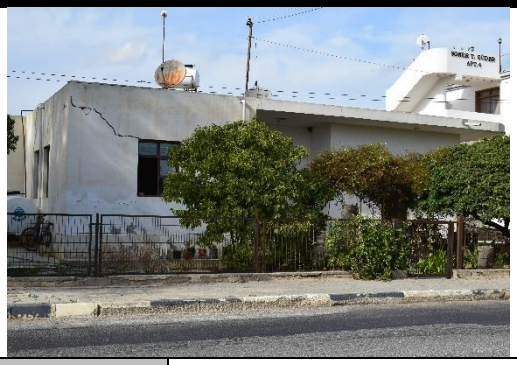
Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Rain penetration here is acting on the terrace acting as a flat roof (not the pitched roof)

Case Study #28 (İ3)

Profile



District:	İskele
Area:	Boğaz
Street name:	Karpaz Anayolu
Latitude:	35°18'49.24"N
Longitude:	33°57'7.29"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks ■

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

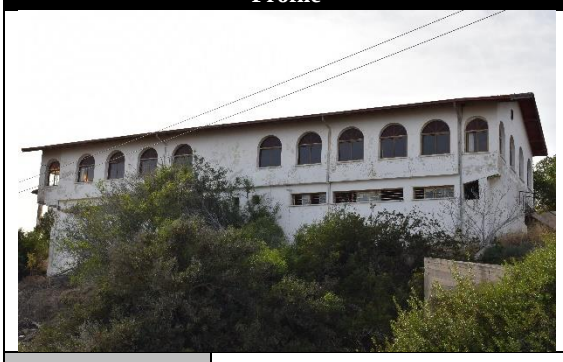
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study # Case Study # 29 (İ4)

Profile



District:	İskele		
Area:	Boğaz		
Street name:	Karpaz Anayolu		
Latitude:	35°18'58.64"N		
Longitude:	33°57'9.35"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

This non-functional hotel was hosting what seemed to be like construction workers who were sleeping there.

Case Study #30 (İ5)

Profile

District:	İskele
Area:	Boğaztepe
Street name:	Cumhuriyet Sk
Latitude:	35°18'56.58"N
Longitude:	33°56'49.87"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974) ■
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied
	Abandoned ■

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking ■
	Corrosion-induced spalling ■
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks ■

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #31 (İ6)

Profile

District:	İskele
Area:	Yarköy (Agios Ilias)
Street name:	No street names were found in the village
Latitude:	35°19'32.95"N
Longitude:	33°55'48.85"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974) ■
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #32 (İ7)

Profile

District:	İskele		
Area:	Turnalar (Gerani)		
Street name:	No street names were found in the village		
Latitude:	35°21'37.63"N		
Longitude:	33°55'19.41"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #33 (İ8)

Profile

District:	İskele
Area:	Yeni İskele (Trikomo)
Street name:	Onay Fadıl Demirciler Cd
Latitude:	35°16'59.57"N
Longitude:	33°53'36.26"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

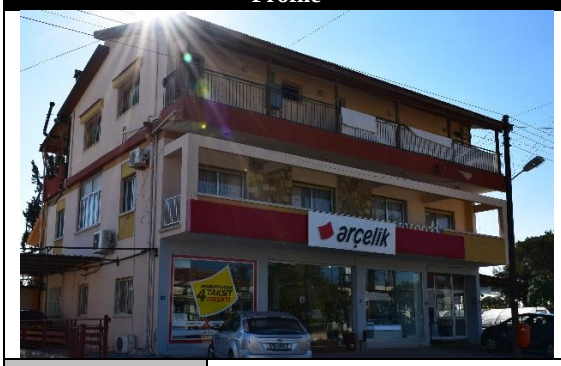
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #34 (İ9)

Profile



District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	Şht. Üstteğmen Mustafa Orhan Cd		
Latitude:	35°17'1.02"N		
Longitude:	33°53'23.63"E		
Structure age:	<14 years	Date (if available): 2003	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #35(İ10)

Profile

District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	Şht. Üstteğmen Mustafa Orhan Cd		
Latitude:	35°17'2.09"N		
Longitude:	33°53'25.90"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #36 (İ11)

Profile

District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	Şht. Üstteğmen Mustafa Orhan Cd		
Latitude:	35°17'0.28"N		
Longitude:	33°53'26.69"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #37 (İ12)

Profile

District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	Şht. Üstteğmen Mustafa Orhan Cd		
Latitude:	35°16'59.45"N		
Longitude:	33°53'26.67"E		
Structure age:	<14 years	Date (if available): 2003	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

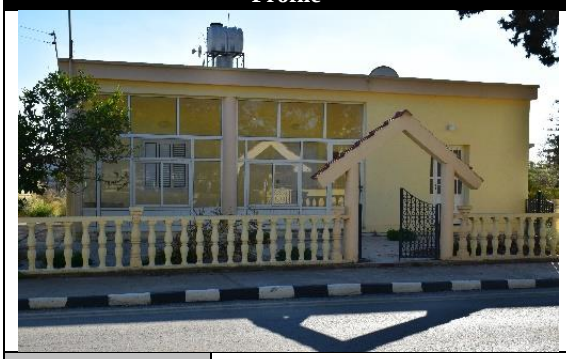
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #38 (İ13)

Profile



District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	20 Temmuz Cd		
Latitude:	35°17'7.94"N		
Longitude:	33°53'52.27"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #39 (İ14)

Profile

District:	İskele		
Area:	Yeni İskele (Trikomo)		
Street name:	20 Temmuz Cd		
Latitude:	35°17'7.84"N		
Longitude:	33°53'50.53"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

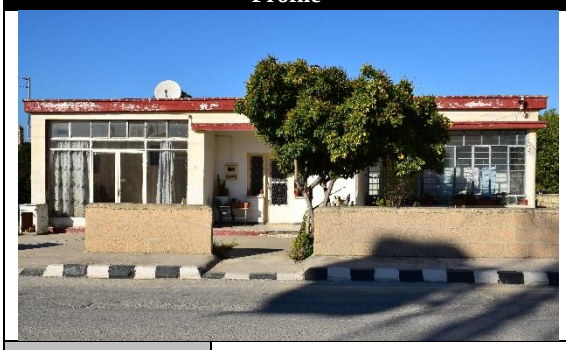
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #40 (İ15)

Profile



District:	İskele
Area:	Yeni İskele (Trikomo)
Street name:	20 Temmuz Cd
Latitude:	35°17'8.47"N
Longitude:	33°53'46.81"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking ■
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage		
Defected wooden door		
Surface defects	dampness	Condensation
		Rising damp ■
		Rain penetration ■
		Leaking pipes, spills and other moisture sources
	Surface cracks on wall finishes	crazing
		Map/pattern cracking
	Efflorescence ■	
	Paint peeling ■	
	Mouldiness ■	
	Wall finishes workmanship problem	
	Staining ■	
Non-structural cracks	Joint cracks ■	

Other notes (if available):

Case Study #41 (İ16)

Profile

District:	İskele		
Area:	Mehmetçik (Galateia)		
Street name:	No street names were found		
Latitude:	35°25'17.33"N		
Longitude:	34° 4'17.25"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #42 (İ17)

Profile

District:	İskele		
Area:	Mehmetçik (Galateia)		
Street name:	No street names were found		
Latitude:	35°25'7.67"N		
Longitude:	34° 4'12.76"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #43 (İ18)

Profile

District:	İskele		
Area:	Mehmetçik (Galateia)		
Street name:	No street names were found		
Latitude:	35°25'5.94"N		
Longitude:	34° 4'12.59"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #44 (İ19)

Profile

District:	İskele		
Area:	Pamuklu (Tavros)		
Street name:	No street names were found		
Latitude:	35°23'42.23"N		
Longitude:	34° 4'38.86"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

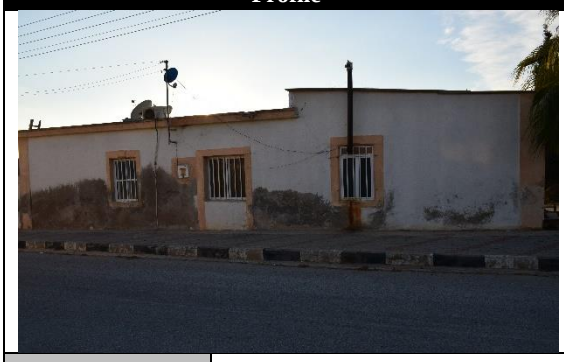
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #45 (İ20)

Profile



District:	İskele		
Area:	Pamuklu (Tavros)		
Street name:	No street names were found		
Latitude:	N 35°23.709'		
Longitude:	E 34°4.622'		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

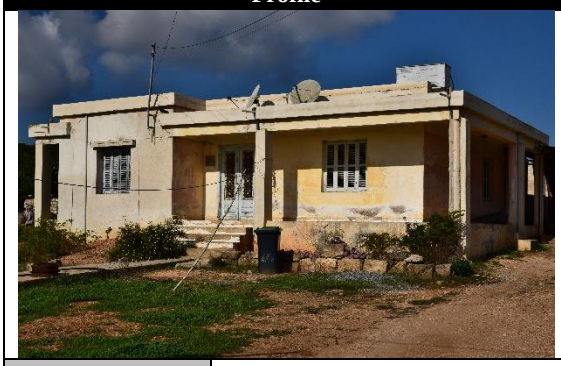
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #46 (İ21)

Profile



District:	İskele
Area:	Derince (Vathylakas)
Street name:	No street names were found
Latitude:	N 35°28.965' (35°28'57.9")
Longitude:	E 34°10.945' (34°10'56.7")

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #47(İ22)

Profile

District:	İskele		
Area:	Derince (Vathylakas)		
Street name:	No street names were found		
Latitude:	35°28'57.50"N		
Longitude:	34°10'54.63"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #48 (İ23)

Profile

District:	İskele		
Area:	Derince (Vathylakas)		
Street name:	No street names were found		
Latitude:	35°28'53.97"N		
Longitude:	34°10'59.01"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #49 (İ24)

Profile

District:	İskele		
Area:	Taşlıca (Neta)		
Street name:	No street names were found		
Latitude:	35°28'9.85"N		
Longitude:	34°12'52.80"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #50 (İ25)

Profile

District:	İskele		
Area:	St Andrew (Apostolos Andreas)		
Street name:	Karpaz Anayolu		
Latitude:	35°39'28.61"N		
Longitude:	34°34'27.31"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

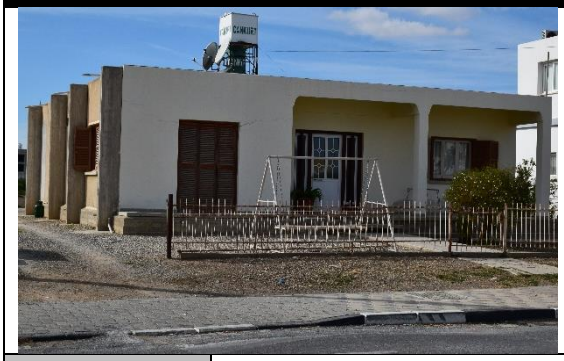
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			■
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #51 (L1)

Profile



District:	Lefkoşa (Nicosia)
Area:	Cihangir (Epicho)
Street name:	No street names were found in the village
Latitude:	35°13'21.58"N
Longitude:	33°30'54.51"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking ■
	Corrosion-induced spalling ■
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks ■

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp ■	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence ■		
	Paint peeling ■		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining ■		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #52 (L2)

Profile

District:	Lefkoşa (Nicosia)
Area:	Değirmenlik (Kythrea)
Street name:	No street names were found in the town
Latitude:	35°14'23.84"N
Longitude:	33°29'19.65"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	■
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

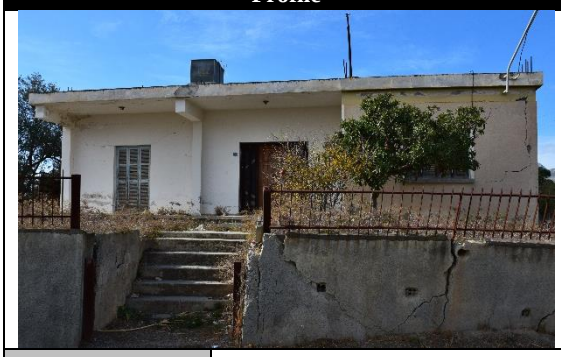
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #53 (L3)

Profile



District:	Lefkoşa (Nicosia)		
Area:	Değirmenlik (Kythrea)		
Street name:	No street names were found		
Latitude:	35°14'56.37"N		
Longitude:	33°28'52.78"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

Case Study #54 (L4)

Profile

District:	Lefkoşa		
Area:	Yiğitler (Arsos)		
Street name:	Vatan Sk		
Latitude:	35° 5'23.02"N		
Longitude:	33°37'38.38"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #55 (L5)

Profile

District:	Lefkoşa		
Area:	Yiğitler (Arsos)		
Street name:	No street names were found		
Latitude:	35° 5'17.64"N		
Longitude:	33°37'28.47"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #56 (L6)

Profile

District:	Lefkoşa
Area:	Yiğitler (Arsos)
Street name:	No street names were found
Latitude:	35° 5'17.64"N
Longitude:	33°37'39.63"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking ■
	Corrosion-induced spalling ■
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
			Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #57 (L7)

Profile

District:	Lefkoşa		
Area:	Yiğitler (Arsos)		
Street name:	No street names were found		
Latitude:	35° 5'30.57"N		
Longitude:	33°37'44.35"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #58 (L8)

Profile

District:	Lefkoşa		
Area:	Erdemli (Tremetousia)		
Street name:	No street names were found		
Latitude:	35° 5'4.14"N		
Longitude:	33°36'17.01"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

The house is for sale

Case Study #59 (L9)

Profile

District:	Lefkoşa		
Area:	Hamitköy		
Street name:	Sütçü Mehmet Sk		
Latitude:	35°13'3.40"N		
Longitude:	33°22'35.78"E		
Structure age:	<14 years	Date (if available): 2009-2010	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #60 (L10)

Profile

District:	Lefkoşa		
Area:	Hamitköy		
Street name:	Sütçü Mehmet Sk		
Latitude:	35°13'4.24"N		
Longitude:	33°22'33.72"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

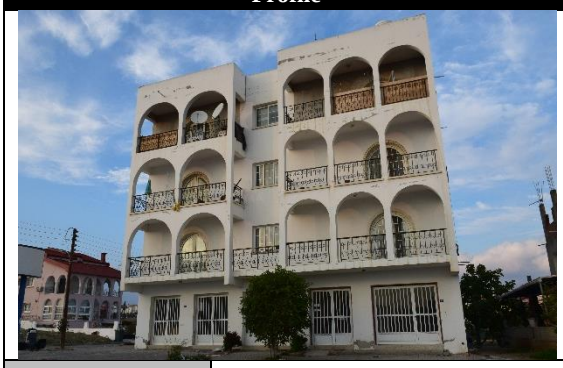
Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #61 (L11)

Profile



District:	Lefkoşa		
Area:	Hamitköy		
Street name:	Sancak Sk		
Latitude:	35°12'59.96"N		
Longitude:	33°22'29.36"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #62 (L12)

Profile

District:	Lefkoşa		
Area:	Hamitköy		
Street name:	Anıttepe Cd		
Latitude:	35°12'57.11"N		
Longitude:	33°22'25.49"E		
Structure age:	<14 years	Date (if available): 2006	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

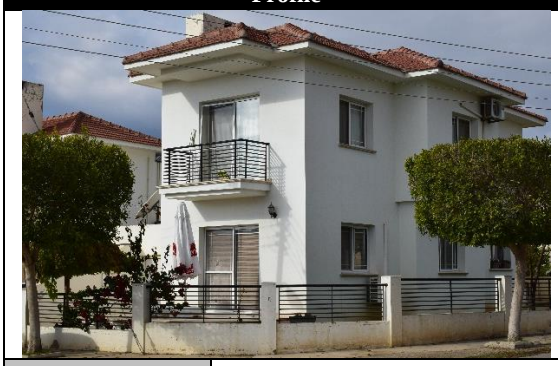
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #63 (L13)

Profile



District:	Lefkoşa
Area:	Hamitköy
Street name:	Anıttepe Cd
Latitude:	35°12'52.53"N
Longitude:	33°22'24.62"E
Structure age:	<14 years — Date (if available): 2004-2005 ■
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #64 (L14)

Profile

District:	Lefkoşa		
Area:	Hamitköy		
Street name:	Anıttepe Cd		
Latitude:	35°12'53.26"N		
Longitude:	33°22'26.27"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

The building is used as fruits storage.

Case Study #65/103 (L15/C3)

Profile

District:	Lefkoşa
Area:	Hamitköy
Street name:	Güven Sk
Latitude:	35°12'46.80"N
Longitude:	33°22'27.68"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment ■
	Residential — House
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction ■
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks ■	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints ■
	Segregation
	Honeycombing ■
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity ■
			Projections in plan
		Beam elementary design faults	Non-continuous beams ■
			Non-uniform beam span and cross-section ■
			Absence of vertical support at beams intersection ■
			Broken axis beams and frames ■
		Slab elementary design faults	Over-stretched one-way slab ■
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration ■
		Short column ■	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources ■	
	Surface cracks on wall finishes	crazing ■	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining ■		
Non-structural cracks	Joint cracks		

Other notes (if available):

The building is not finished except for the ground floor where it is furnished and occupied. Thus it is considered a shared case study between Lefcosa case study section and the under construction case study section.

Case Study #66 (L16)

Profile

District:	Lefkoşa
Area:	Hamitköy
Street name:	Canan Sk
Latitude:	35°12'45.18"N
Longitude:	33°22'7.75"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #67 (L17)

Profile

District:	Lefkoşa		
Area:	Goenyeli		
Street name:	Taşkınsu Sk		
Latitude:	35°12'41.64"N		
Longitude:	33°17'35.24"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		■
	Surface cracks on wall finishes	crazing		
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

The profile picture shows the rear facade as the front facade had lots of parking cars.

Case Study #68 (L18)

Profile

District:	Lefkoşa		
Area:	Goenyeli		
Street name:	Sazlıka Sk		
Latitude:	35°12'40.60"N		
Longitude:	33°17'36.01"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #69 (L19)

Profile

District:	Lefkoşa		
Area:	Goenyeli		
Street name:	Kızılçam Sk		
Latitude:	35°12'40.97"N		
Longitude:	33°17'41.41"E		
Structure age:	<14 years	Date (if available): 2004-2005	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #70 (L20)

Profile

District:	Lefkoşa
Area:	Goenyeli
Street name:	Yaşar Doğu Sk
Latitude:	35°12'46.35"N
Longitude:	33°18'0.86"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		■

Other notes (if available):

The profile picture shows the rear facade as the front facade is covered with vegetation.

Case Study #71 (L21)

Profile

District:	Lefkoşa		
Area:	Goenyeli		
Street name:	Yaşar Doğu Sk		
Latitude:	35°12'45.84"N		
Longitude:	33°17'59.29"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #72 (L22)

Profile

District:	Lefkoşa
Area:	Goenyeli
Street name:	Yaşar Doğu Sk
Latitude:	35°12'43.36"N
Longitude:	33°17'59.34"E

Structure age:	<14 years	Date (if available): 2004-2005	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

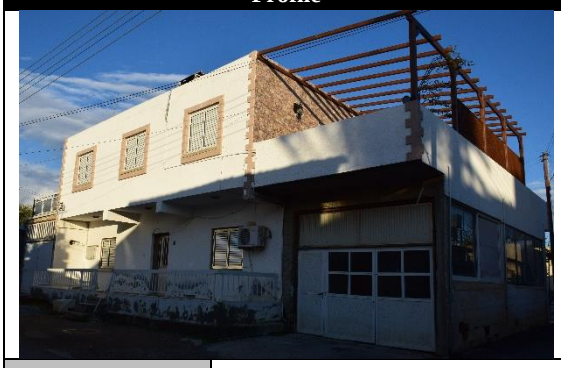
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #73 (L23)

Profile



District:	Lefkoşa
Area:	Goenyeli
Street name:	Anamurli Kurt Ali Sk
Latitude:	35°12'52.22"N
Longitude:	33°18'5.99"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #74 (L24)

Profile

District:	Lefkoşa		
Area:	Goenyeli		
Street name:	Şht. Hüseyin Amca Cd		
Latitude:	35°12'54.84"N		
Longitude:	33°17'48.26"E		
Structure age:	<14 years	Date (if available): 2002-2003	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #75 (L25)

Profile

District:	Lefkoşa		
Area:	Alayköy Sanayi Bölgesi		
Street name:	No street names were found		
Latitude:	35°12'21.96"N		
Longitude:	33°16'5.66"E		
Structure age:	<14 years	Date (if available): 2009-2010	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #76(G1)

Profile

District:	Girne		
Area:	Bahçeli (Kalograia)		
Street name:	No street names were found		
Latitude:	35°20'29.67"N		
Longitude:	33°37'40.73"E		
Structure age:	<14 years	Date (if available): ~2005	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #77 (G2)

Profile

District:	Girne		
Area:	Esentepe (Agios Amvrosios)		
Street name:	No street names were found		
Latitude:	35°20'28.56"N		
Longitude:	33°34'55.83"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

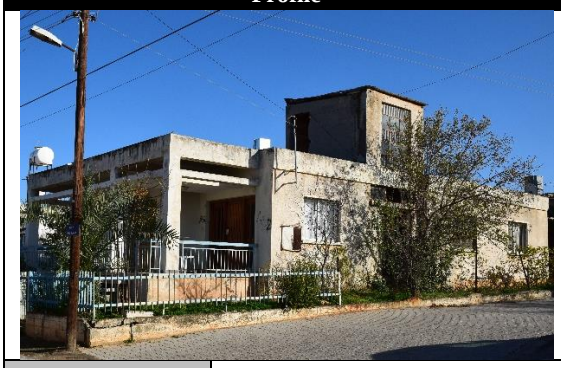
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #78 (G3)

Profile



District:	Girne		
Area:	Esentepe (Agios Amvrosios)		
Street name:	No street names were found		
Latitude:	35°20'31.00"N		
Longitude:	33°34'59.67"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

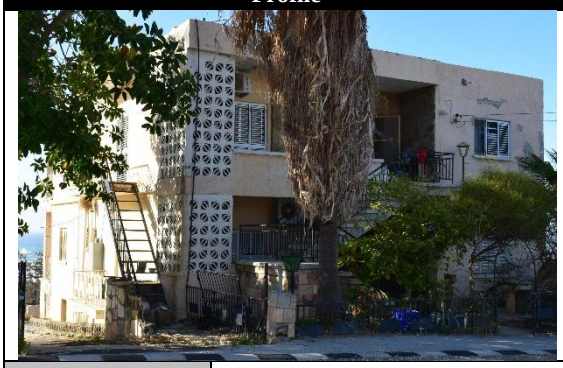
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #79 (G4)

Profile



District:	Girne		
Area:	Esentepe (Agios Amvrosios)		
Street name:	No street names were found		
Latitude:	35°20'38.30"N		
Longitude:	33°34'40.02"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #80 (G5)

Profile

District:	Girne		
Area:	Esentepe (Agios Amvrosios)		
Street name:	No street names were found		
Latitude:	35°20'38.28"N		
Longitude:	33°34'41.61"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #81 (G6)

Profile

District:	Girne		
Area:	Arapköy (Klepini)		
Street name:	Beş Parmaklar Cd		
Latitude:	N 35°18.022' (35°18'1.3")		
Longitude:	E 33°26.124' (33°26'7.4")		
Structure age:	<14 years	Date (if available): 2004-2005	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

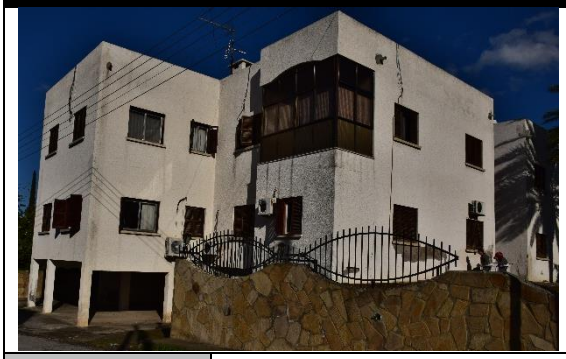
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #82 (G7)

Profile



District:	Girne		
Area:	Ozanköy or Kazafana (Kazafani or Kazaphani)		
Street name:	Sehit Necmi Kaya Caddesi		
Latitude:	35°19'2.66"N		
Longitude:	33°21'14.00"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #83 (G8)

Profile

District:	Girne		
Area:	Ozanköy or Kazafana (Kazafani or Kazaphani)		
Street name:	Zafer Caddesi		
Latitude:	35°18'29.44"N		
Longitude:	33°21'1.46"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	■
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

BU BİNA
21-11-1986 TARİHİNDE
HİZMETE ACILMISTIR
8-6-2001 TARİHİNDE

RESTORE EDİLMİSTİR

Case Study #84 (G9)

Profile

District:	Girne		
Area:	Girne (Kyrenia)		
Street name:	20 Temmuz Kordonboyu Caddesi		
Latitude:	35°20'30.12"N		
Longitude:	33°19'15.62"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #85 (G10)

Profile

District:	Girne		
Area:	Sadrazamköy (Livera)		
Street name:	No street names were found		
Latitude:	35°23'11.72"N		
Longitude:	32°57'49.88"E		
Structure age:	<14 years	Date (if available): 2004~2007	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

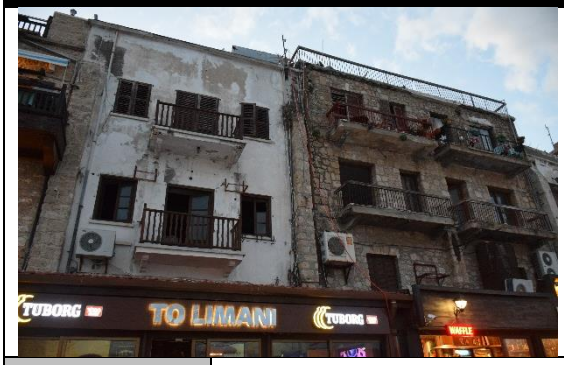
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
		Efflorescence	■
		Paint peeling	■
		Mouldiness	
		Wall finishes workmanship problem	
		Staining	■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #86(G11)

Profile



District:	Girne		
Area:	Girne (Kyrenia)		
Street name:	20 Temmuz Kordonboyu Caddesi		
Latitude:	35°20'31.46"N		
Longitude:	33°19'9.66"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #87 (G12)

Profile

District:	Girne		
Area:	Aşağı Taşkent or Kaynakköy (Sychari or Sichari)		
Street name:	No street names were found		
Latitude:	35°16'2.68"N		
Longitude:	33°22'58.68"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		■
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	■
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #88 (G13)

Profile

District:	Girne		
Area:	Aşağı Taşkent or Kaynakköy (Sychari or Sichari)		
Street name:	No street names were found		
Latitude:	35°16'45.09"N		
Longitude:	33°22'39.66"E		
Structure age:	<14 years	Date (if available): ~2006	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #89(G14)

Profile

District:	Girne
Area:	Dikmen (Dikomo)
Street name:	Dr. Fazil Küçük Cd
Latitude:	35°16'17.95"N
Longitude:	33°19'3.92"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #90 (G15)

Profile

District:	Girne		
Area:	Dikmen (Dikomo)		
Street name:	Dr. Fazil Küçük Cd		
Latitude:	35°16'22.70"N		
Longitude:	33°18'45.48"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #91 (G16)

Profile

District:	Girne		
Area:	Dikmen (Dikomo)		
Street name:	Dr. Fazil Küçük Cd		
Latitude:	35°16'22.63"N		
Longitude:	33°18'44.95"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

The house is for sale.

Case Study #92 (G17)

Profile

District:	Girne		
Area:	Girne (Kyrenia)		
Street name:	Naci Talat Cd		
Latitude:	35°20'11.54"N		
Longitude:	33°18'23.95"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #93 (G18)

Profile

District:	Girne		
Area:	Karaoğlanoğlu (Agios Georgios)		
Street name:	Karaoğlanoğlu Cadddesi		
Latitude:	35°20'37.88"N		
Longitude:	33°15'42.93"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		■
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			
	Wall finishes workmanship problem			
	Staining			
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #94(G19)

Profile

District:	Girne
Area:	Karaoğlanoğlu (Agios Georgios)
Street name:	Karaoğlanoğlu Cadddesi
Latitude:	35°20'37.55"N
Longitude:	33°15'44.01"E

Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #95 (G20)

Profile

District:	Girne		
Area:	Alsancak (Karavas)		
Street name:	Ankara Cd		
Latitude:	35°20'47.44"N		
Longitude:	33°12'20.04"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

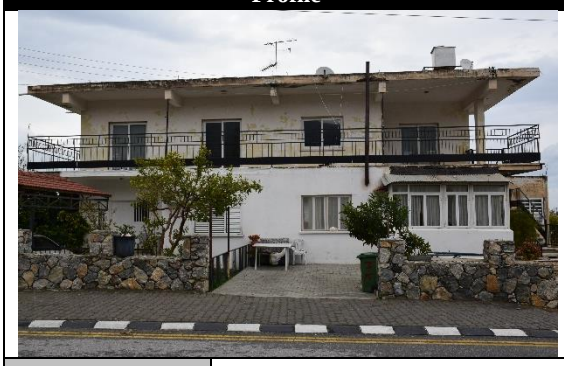
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #96 (G21)

Profile



District:	Girne		
Area:	Alsancak (Karavas)		
Street name:	Ankara Cd		
Latitude:	35°20'38.90"N		
Longitude:	33°11'55.44"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		■
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #97 (G22)

Profile

District:	Girne		
Area:	Alsancak (Karavas)		
Street name:	Ankara Cd		
Latitude:	35°20'37.39"N		
Longitude:	33°11'40.07"E		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	■
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	■
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

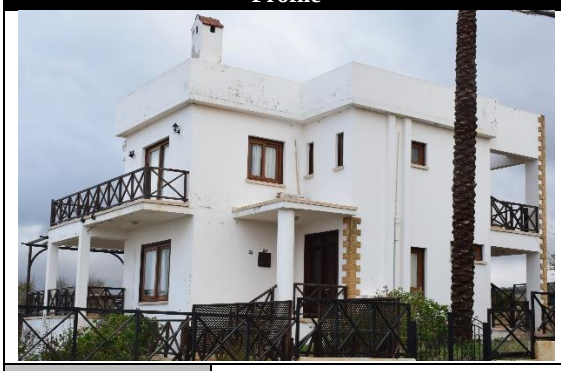
Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		■
	Efflorescence			■
	Paint peeling			■
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			■

Other notes (if available):

Case Study #98(G23)

Profile



District:	Girne
Area:	Sadrazamköy (Livera)
Street name:	No street names were found
Latitude:	35°23'9.85"N
Longitude:	32°57'48.79"E
Structure age:	<14 years — Date (if available): 2004~2007 ■
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House ■
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
		Short column	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #99 (G24)

Profile

District:	Girne		
Area:	Sadrazamköy (Livera)		
Street name:	No street names were found		
Latitude:	35°23'23.20"N		
Longitude:	32°56'57.67"E		
Structure age:	<14 years	Date (if available): 2004~2007	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	■
		Rain penetration	■
		Leaking pipes, spills and other moisture sources	■
	Surface cracks on wall finishes	crazing	■
		Map/pattern cracking	■
	Efflorescence		■
	Paint peeling		■
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		■
Non-structural cracks	Joint cracks		■

Other notes (if available):

Case Study #100 (G25)

Profile

District:	Girne (Kyrenia)		
Area:	Arapköy (Klepini)		
Street name:	Beş Parmaklar Cd		
Latitude:	35°18'6.72"N		
Longitude:	33°26'9.65"E		
Structure age:	<14 years	Date (if available): December 2004	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		■

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	■
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	■

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage				
Defected wooden door				
Surface defects	dampness	Condensation		
		Rising damp		
		Rain penetration		■
		Leaking pipes, spills and other moisture sources		
	Surface cracks on wall finishes	crazing		■
		Map/pattern cracking		
	Efflorescence			
	Paint peeling			
	Mouldiness			■
	Wall finishes workmanship problem			
	Staining			■
Non-structural cracks	Joint cracks			

Other notes (if available):

This case study is about a suspended project called Amaranta valley project which contain many unfinished houses due to technical and legal problems.

Case Study #101 (C1)

Profile

District:	Mağusa
Area:	Gazimağusa Sanayi Bölgesi (Famagusta Greater Industrial Area)
Street name:	Yeni Hastane Yolu
Latitude:	N 35°8.646' (35°8'38.8")
Longitude:	E 33°54.189' (33°54'11.3")

Structure age:	<14 years	Date (if available): 2004 ~ 2007	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	■
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #102 (C2)

Profile

District:	Mağusa		
Area:	Gazimağusa Sanayi Bölgesi (Famagusta Greater Industrial Area)		
Street name:	Yeni Hastane Yolu		
Latitude:	N 35°8.784' (35°8'47.0")		
Longitude:	E 33°54.123' (33°54'7.4")		
Structure age:	<14 years	Date (if available): 2009 ~ 2010	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	■
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #103 (C3)

Profile

District:	Mağusa		
Area:	Gazimağusa Sanayi Bölgesi (Famagusta Greater Industrial Area)		
Street name:	Yeni Hastane Yolu		
Latitude:	N 35°8.717' (35°8'43.0")		
Longitude:	E 33°53.985' (33°53'59.1")		
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		■
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	■
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				■
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #104 (C4)

Profile

District:	Mağusa
Area:	Sakarya
Street name:	Hasan Barboçoli Sk
Latitude:	35° 8'1.39"N
Longitude:	33°55'10.08"E
Structure age:	<14 years — Date (if available): 2014 ~ 2015 ■
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974)
Building type:	Residential — Apartment ■
	Residential — House
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction ■
	Occupied
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	■
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	■
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	■
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	■
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #105 (C5)

Profile

District:	Mağusa		
Area:	Tuzla (Enkomi)		
Street name:	Mehmet Ömer Sk		
Latitude:	35° 9'22.10"N		
Longitude:	33°53'41.12"E		
Structure age:	<14 years	Date (if available): Early 2014	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		■
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		■
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	■
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Inter-storey strength irregularity (Weak storey)	
			Inter-storey stiffness irregularity (Soft storey)	
			Discontinuity columns or shear walls	■
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #106 (C6)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	Pembe Sk		
Latitude:	35° 9'24.44"N		
Longitude:	33°54'28.07"E		
Structure age:	<14 years	Date (if available): 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	■
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #107 (C7)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Hasan Barboçoli Sk		
Latitude:	35° 7'53.65"N		
Longitude:	33°55'14.99"E		
Structure age:	<14 years	Date (if available): Early 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #108 (C8)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	İsmet İnönü Blv		
Latitude:	35° 8'19.51"N		
Longitude:	33°55'3.70"E		
Structure age:	<14 years	Date (if available): Late 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	■
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #109 (C9)

Profile

District:	Mağusa		
Area:	Dumlupınar		
Street name:	Serbest Liman Yolu Sk		
Latitude:	35° 7'50.63"N		
Longitude:	33°55'55.31"E		
Structure age:	<14 years	Date (if available): 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	■
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	■
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	■
			Soft storey	■
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
		Short column		■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #110 (C10)

Profile

District:	Mağusa		
Area:	Sakarya		
Street name:	Hasan Barboçolli Sk		
Latitude:	35° 7'54.46"N		
Longitude:	33°55'23.98"E		
Structure age:	<14 years	Date (if available): 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	■
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Apartment name: UZUN 23

Case Study #111 (C11)

Profile

District:	Mağusa		
Area:	Karakol		
Street name:	M. Abdullah Sk		
Latitude:	35° 7'56.90"N		
Longitude:	33°55'49.67"E		
Structure age:	<14 years	Date (if available): 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Inter-storey strength irregularity (Weak storey)	
			Inter-storey stiffness irregularity (Soft storey)	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			

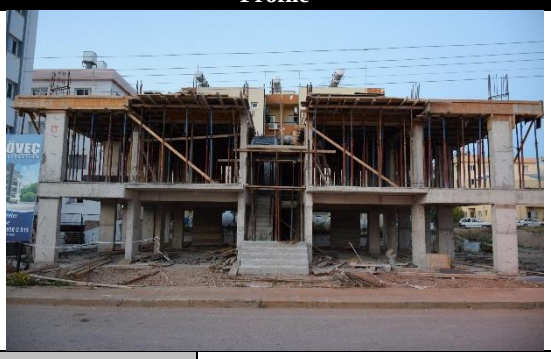
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #112 (C12)

Profile



District:	Mağusa		
Area:	Çanakkale		
Street name:	Hacı Bektaş Sk		
Latitude:	35° 7'44.46"N		
Longitude:	33°55'4.14"E		
Structure age:	<14 years	Date (if available): 2015	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Inter-storey strength irregularity (Weak storey)	
			Inter-storey stiffness irregularity (Soft storey)	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #113 (C13)

Profile

District:	Mağusa		
Area:	Baykal		
Street name:	Mustafa Kurtuluş Sk		
Latitude:	35° 7'6.74"N		
Longitude:	33°55'49.61"E		
Structure age:	<14 years	Date (if available): 2004~2007	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Inter-storey strength irregularity (Weak storey)	
			Inter-storey stiffness irregularity (Soft storey)	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			

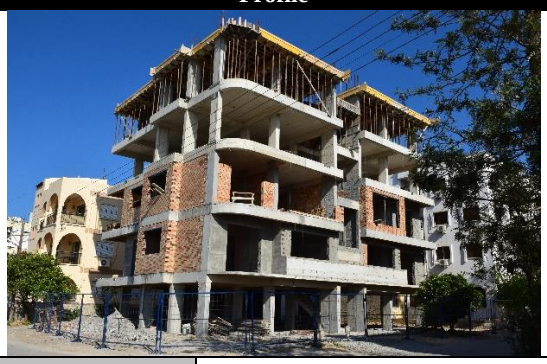
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		■
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #114 (C14)

Profile



District:	Mağusa
Area:	Baykal
Street name:	Mustafa Kurtuluş Sk
Latitude:	35° 7'8.87"N
Longitude:	33°55'54.97"E

Structure age:	<14 years	Date (if available): 2017	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #115 (C15)

Profile

District:	Mağusa		
Area:	Çanakkale		
Street name:	No street names were found		
Latitude:	35° 7'19.23"N		
Longitude:	33°55'22.74"E		
Structure age:	<14 years	Date (if available): March 2016	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	■
			Soft storey	■
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	■
			Irregular column and/or shear-wall plan configuration	
	Short column			■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #116 (C16)

Profile

District:	Mağusa		
Area:	Çanakkale		
Street name:	Sht. İbrahim Kazım Cd		
Latitude:	35° 7'25.53"N		
Longitude:	33°55'24.20"E		
Structure age:	<14 years	Date (if available): Mid 2016	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
	Short column			■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #117 (C17)

Profile

District:	Mağusa		
Area:	Çanakkale		
Street name:	Sht. İbrahim Kazım Cd		
Latitude:	35° 7'31.93"N		
Longitude:	33°55'20.07"E		
Structure age:	<14 years	Date (if available): 2017	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		■
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			■

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #118 (C18)

Profile

District:	Mağusa
Area:	Çanakkale
Street name:	Süvariler Sk
Latitude:	35° 7'47.84"N
Longitude:	33°55'1.08"E
Structure age:	<14 years; Date (if available): 2017 ■
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974)
Building type:	Residential: Apartment ■
	Residential: House
	Residential: Dormitory
	Public
	Commercial
Building status:	Under Construction ■
	Occupied
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints ■
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames ■
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
	Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration ■
	Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage		
Defected wooden door		
Surface defects	dampness	Condensation
		Rising damp
		Rain penetration
		Leaking pipes, spills and other moisture sources
	Surface cracks on wall finishes	crazing
		Map/pattern cracking
	Efflorescence	
	Paint peeling	
	Mouldiness	
	Wall finishes workmanship problem	
	Staining	
Non-structural cracks	Joint cracks	

Other notes (if available):

Case Study #119 (C19)

Profile

District:	Mağusa		
Area:	Çanakkale		
Street name:	Akçakoca Sk		
Latitude:	35° 7'53.06"N		
Longitude:	33°54'55.72"E		
Structure age:	<14 years	Date (if available): Mid 2016	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
		Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	■
		Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #120 (C20)

Profile

District:	Mağusa
Area:	Tuzla (Enkomi)
Street name:	Sadık Cemil Sk
Latitude:	35° 9'16.43"N
Longitude:	33°53'44.12"E
Structure age:	<14 years — Date (if available): 2015
	Between 14 and 43 years (1974-2003)
	>43 years (Before 1974)
Building type:	Residential — Apartment
	Residential — House
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction
	Occupied
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
	Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Inter-storey strength irregularity (Weak storey)
			Inter-storey stiffness irregularity (Soft storey)
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
	Short column		

Non-Structural Defects

Waterproofing defects, water leakage and seepage		
Defected wooden door		
Surface defects	dampness	Condensation
		Rising damp
		Rain penetration
		Leaking pipes, spills and other moisture sources
	Surface cracks on wall finishes	crazing
		Map/pattern cracking
	Efflorescence	
	Paint peeling	
	Mouldiness	
	Wall finishes workmanship problem	
	Staining	
Non-structural cracks	Joint cracks	

Other notes (if available):

Case Study #121 (C21)

Profile

District:	Mağusa		
Area:	Tuzla (Enkomi)		
Street name:	No street names were found		
Latitude:	35° 9'18.67"N		
Longitude:	33°53'23.00"E		
Structure age:	<14 years	Date (if available): 2017	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #122 (C22)

Profile

District:	Mağusa		
Area:	Tuzla (Enkomi)		
Street name:	No street names were found		
Latitude:	35° 9'18.93"N		
Longitude:	33°53'23.79"E		
Structure age:	<14 years	Date (if available): 2016	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	■
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #123 (C23)

Profile

District:	İskele		
Area:	Taşlıca (Neta)		
Street name:	No street names were found		
Latitude:	N 35°28.151' (35°28'9.1")		
Longitude:	E 34°12.948' (34°12'56.9")		
Structure age:	<14 years	Date (if available): 2013	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	■
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	■
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
		Short column		

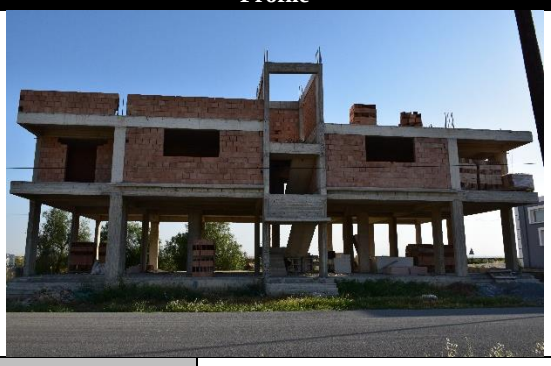
Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #124 (C24)

Profile



District:	Lefkoşa
Area:	Düzova (Exometochi)
Street name:	Lefkoşa-Gazimağusa Anayolu
Latitude:	35°12'45.80"N
Longitude:	33°31'25.46"E

Structure age:	<14 years	Date (if available): 2013	■
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	■
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		■
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks		
Corrosion of metals embedded in concrete	Corrosion-induced cracking	
	Corrosion-induced spalling	
	Cracks due to embedment of dissimilar metals (handrails)	
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement	
	Premature removal of forms	
	Cold joints	■
	Segregation	
	Honeycombing	■
	Improper grades of slab surfaces	
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks	
	Cantilevered member cracks	
	Settlement cracks	

Seismic Design Faults

Week column-strong beam				
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)	
			Floor discontinuity	
			Projections in plan	
		Beam elementary design faults	Non-continuous beams	
			Non-uniform beam span and cross-section	
			Absence of vertical support at beams intersection	
			Broken axis beams and frames	
		Slab elementary design faults	Over-stretched one-way slab	
			Poorly supported or heavily loaded cantilevered slabs	
	Pounding and separation problem			
	Vertical structural configuration	Irregularity in elevation	Weak storey	
			Soft storey	
			Discontinuity of columns or shear walls	
		Vertical structural element elementary design fault	Broken axis columns	
			Irregular column and/or shear-wall plan configuration	
	Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):

Case Study #65/125 (L15/C25)

Profile

District:	Lefkoşa
Area:	Hamitköy
Street name:	Güven Sk
Latitude:	35°12'46.80"N
Longitude:	33°22'27.68"E
Structure age:	<14 years — Date (if available):
	Between 14 and 43 years (1974-2003) ■
	>43 years (Before 1974)
Building type:	Residential — Apartment ■
	Residential — House
	Residential — Dormitory
	Public
	Commercial
Building status:	Under Construction ■
	Occupied ■
	Abandoned

Reinforced Concrete Defects

Drying shrinkage cracks ■	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints ■
	Segregation
	Honeycombing ■
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity ■
			Projections in plan
		Beam elementary design faults	Non-continuous beams ■
			Non-uniform beam span and cross-section ■
			Absence of vertical support at beams intersection ■
			Broken axis beams and frames ■
		Slab elementary design faults	Over-stretched one-way slab ■
			Poorly supported or heavily loaded cantilevered slabs
		Pounding and separation problem	
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration ■
		Short column ■	

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources ■	
	Surface cracks on wall finishes	crazing ■	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining ■		
Non-structural cracks	Joint cracks		

Other notes (if available):

The building is not finished except for the ground floor where it is furnished and occupied. Thus it is considered a shared case study between Lefcosa case study section and the under construction case study section.

5.5 Findings and Discussion

5.5.1 Sample 1: Completed Buildings

5.5.1.1 Building Ages of the Case Study Sample

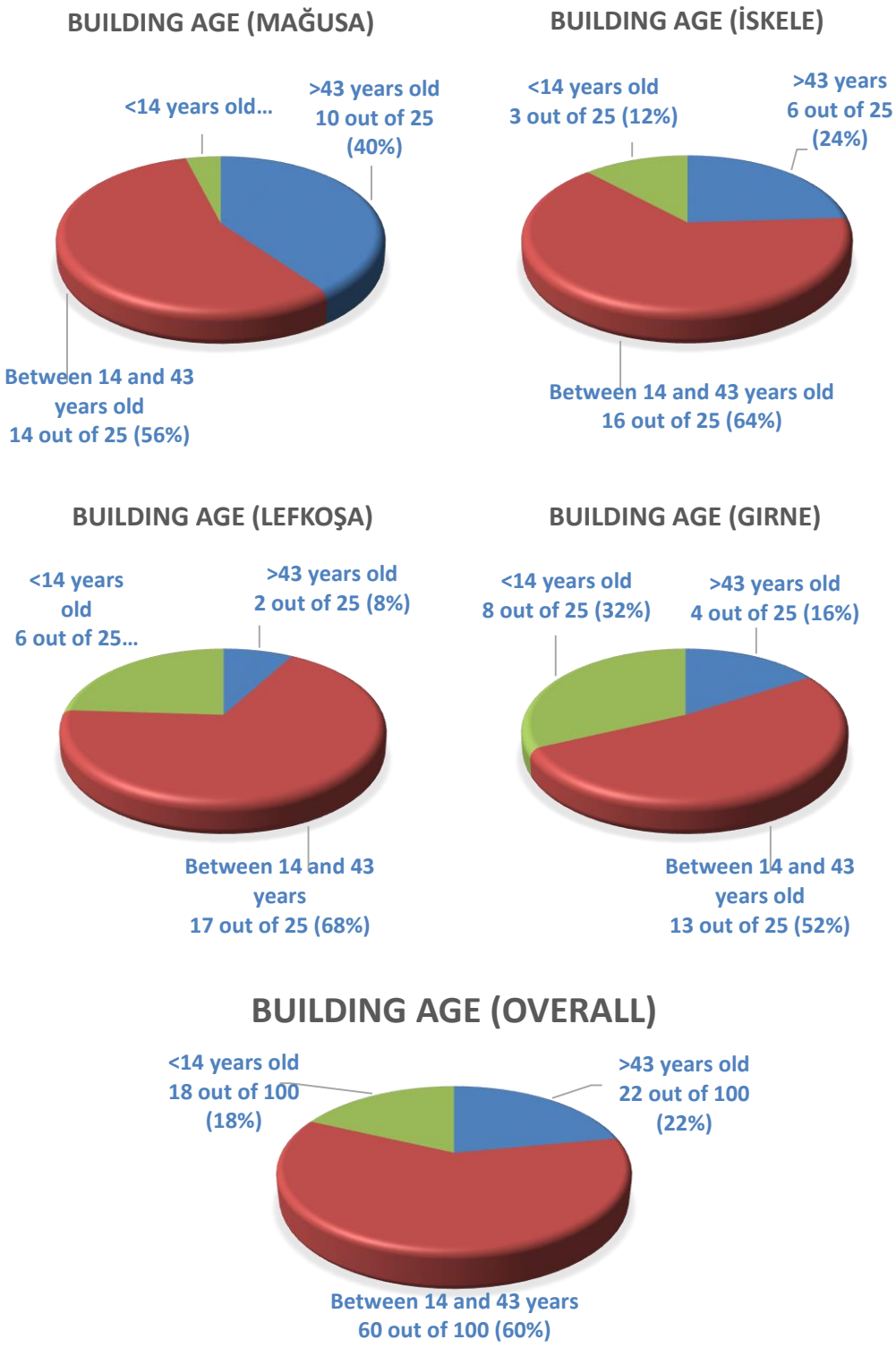


Figure 5.1: Pie Chart Showing the Statistics for Ages of the Case Studies

While roaming around North Cyprus looking for case studies, it was found that the easiest buildings to find are of those aged between 14 and 43 years old. Thus this age range composed the majority of the case studies in all the four cities (60% overall).

It is difficult to find intensely defected buildings that are younger than 14 years old, thus they composed the minority of the case studies with an overall percentage of 18%. However, in the cities of Lefkoşa and Girne this age group was not the minority with percentages of 24% and 32% respectively. This could be because these 2 cities are larger in urban than Mağusa and İskele which results for a higher demand for developments and thus more chance to find defected new buildings (see Table 1.1).

On the other hand, old buildings (buildings before 1974) are quite easy to find in North Cyprus. They are mostly abandoned and excessively defected. They composed 22% of the overall sample. Worthy to mention, the district of Mağusa included the highest percentage of old building at 40% followed by İskele at 24%. This is not a surprise since Mağusa contains the famous ghost city named Maraş/Varosha. The area around this ghost city and the areas near the border between the Turkish Republic of North Cyprus and the Republic of Cyprus contain abundant of old buildings.

5.5.1.2 Building Type

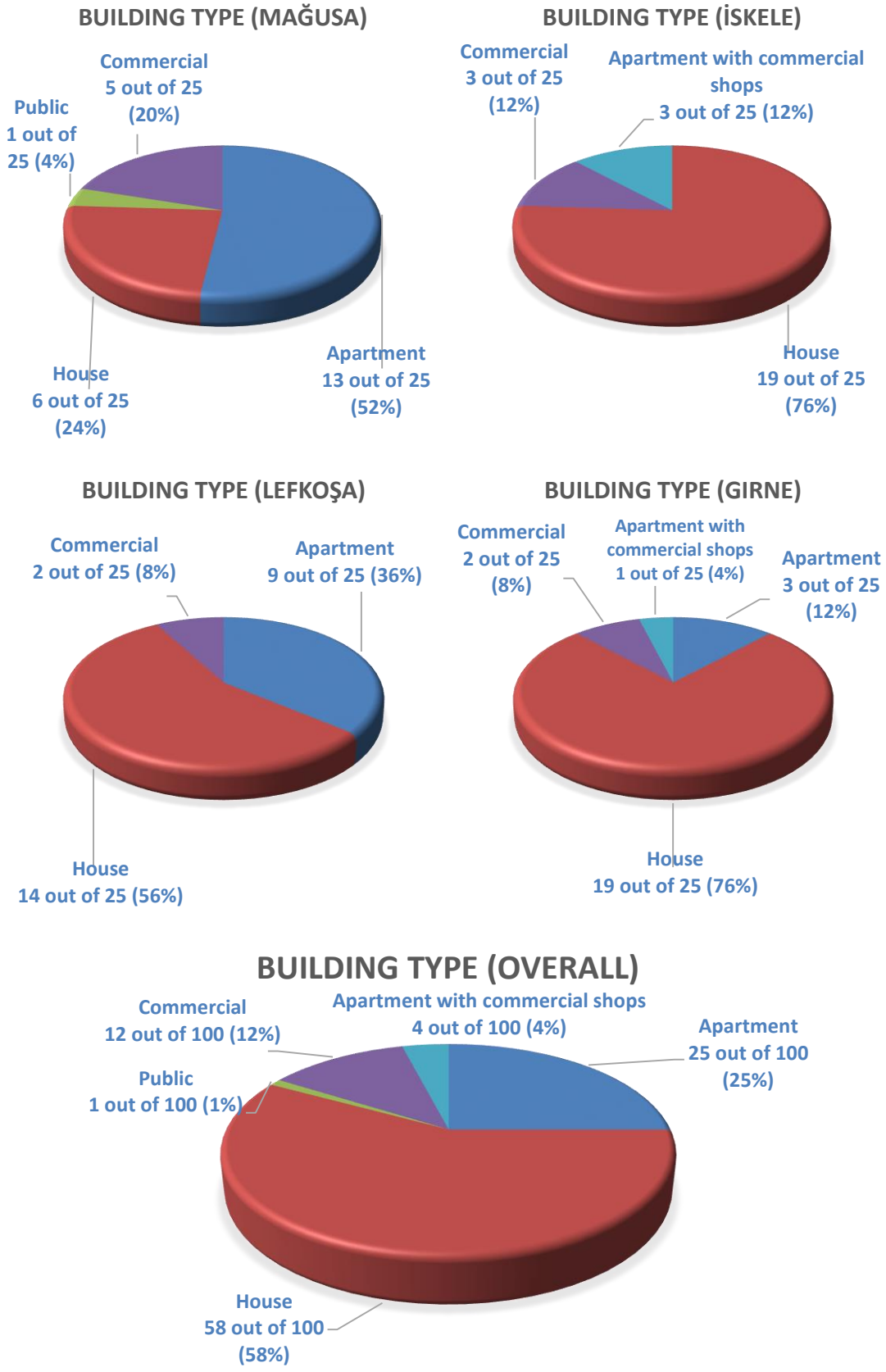


Figure 5.2: Pie Chart Showing the Statistics for Building Types of the Case Studies

Residential Building types composed the majority of the case studies (87%). They varied between houses (58%), apartments (25%) and apartments with commercial shops on the ground floor (4%). The house type represented the majority of the residential buildings in all the cities except for Mağusa where apartment case studies were more than house ones (52% apartment type residential buildings in Mağusa). Apartments with commertial shops composed 4% and existed only in the cities of İskele and Girne with a percentage of 12% (3 cases) and 4% (1 case) respectively.

On the other hand, commercial type buildings composed only 12% of the sample and varied between 8% in both Lefkoşa and Girne (2 cases each), 12% (3 cases) in İskele and 20% (5 cases) in Mağusa. There was only a single case of public building type in the city on Mağusa.

5.5.1.3 Building Status

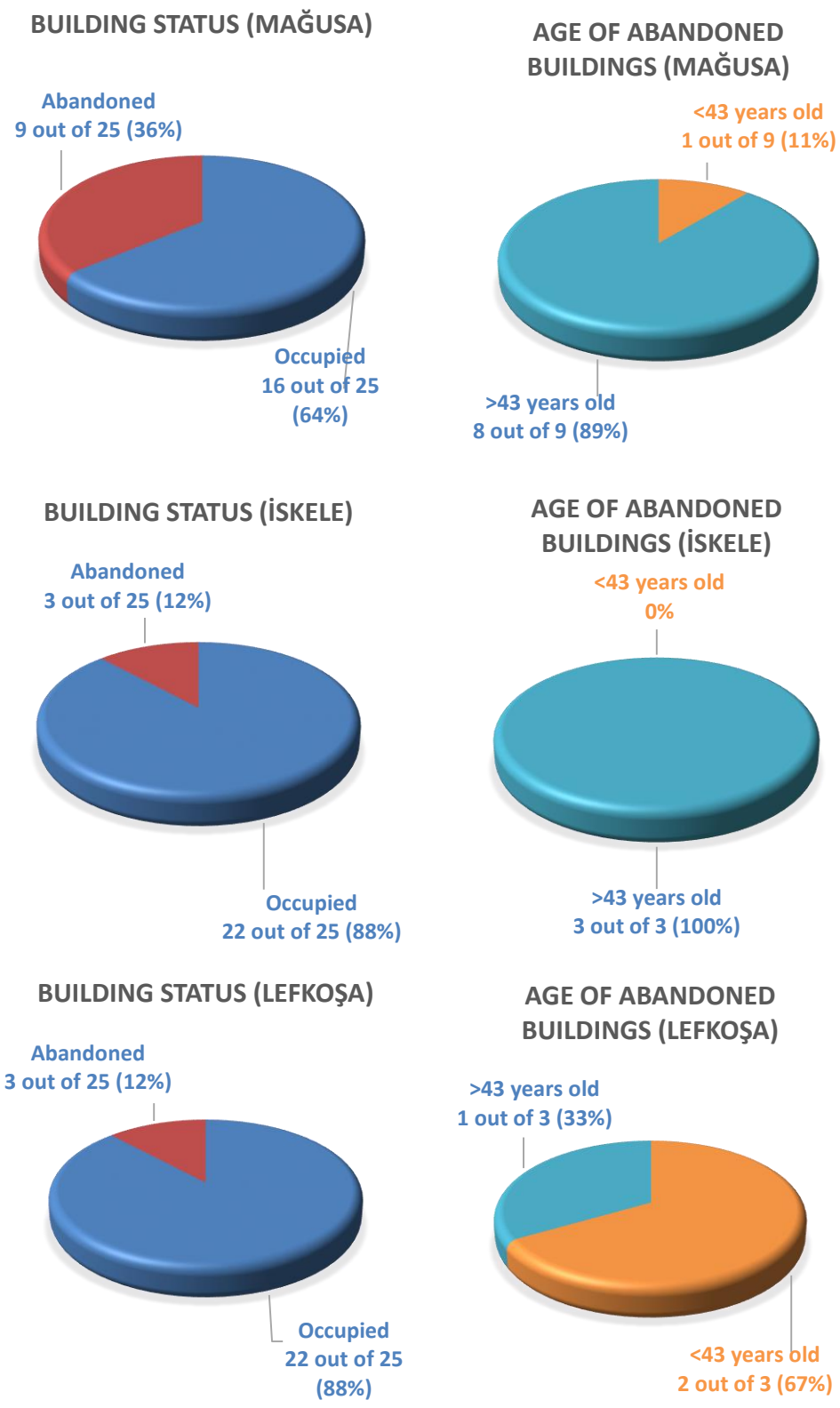


Figure 5.3: Pie Chart Showing the Statistics for Status of the Case Studies (Whether Occupied or Abandoned) and the Ages of Abandoned Buildings for Mağusa, İskele and Lefkoşa Districts

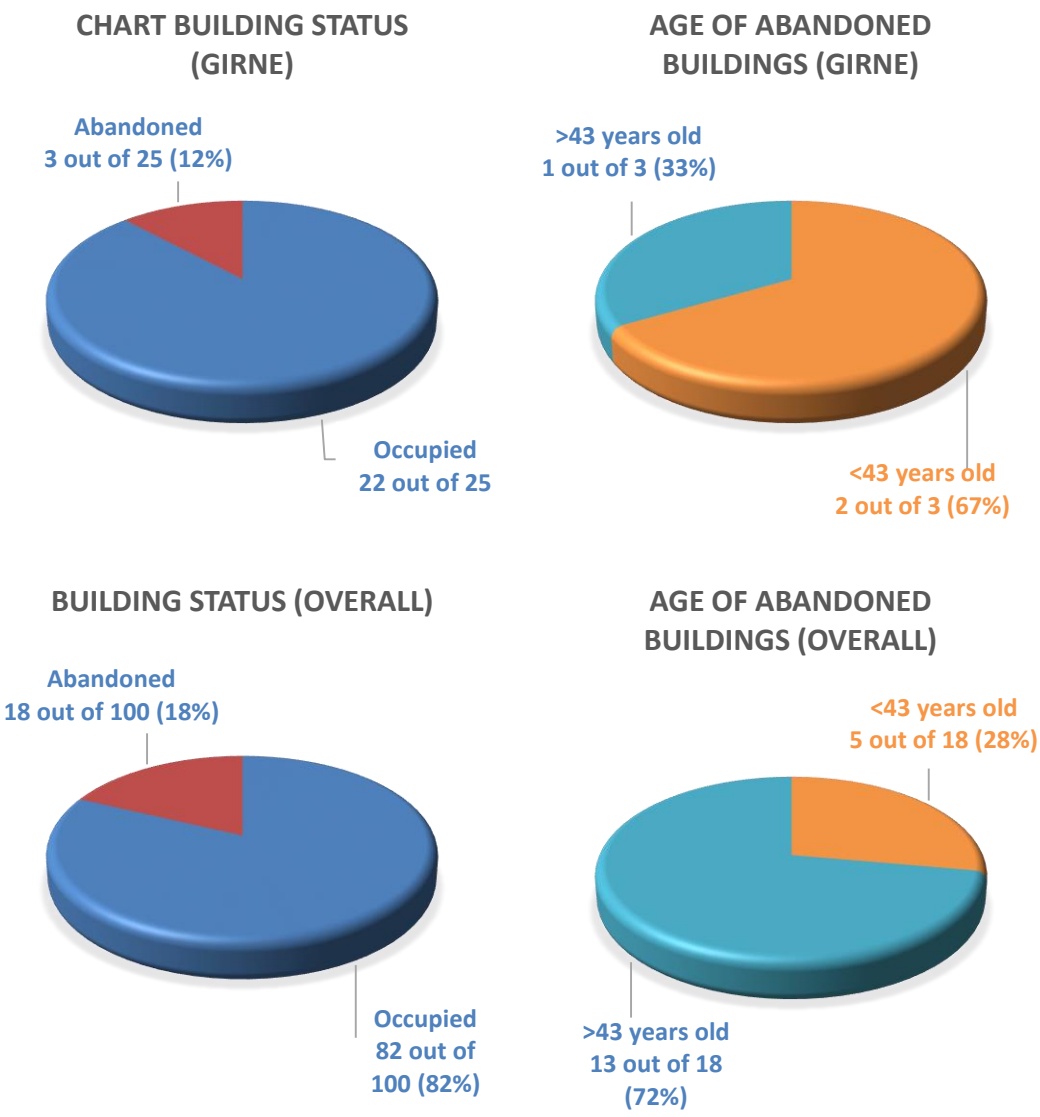


Figure 5.4: Pie Chart Showing the Statistics for Status of the Case Studies (Whether Occupied or Abandoned) and the Ages of Abandoned Buildings for Girne District and Overall

For relevance issues, abandoned building were kept minimum (18% of the case studies were abandoned buildings). There are 3 abandoned buildings for each district (12% per district) except for the district of Mağusa which has 9 (36% of Gazimagiusa case studies). No surprise, most of these abandoned building are older than 43 years (72% of the abandoned building are older than 43 years old) as abandoned buildings younger than 43 years old made 28% of the total abandoned buildings.

5.5.1.4 Defects

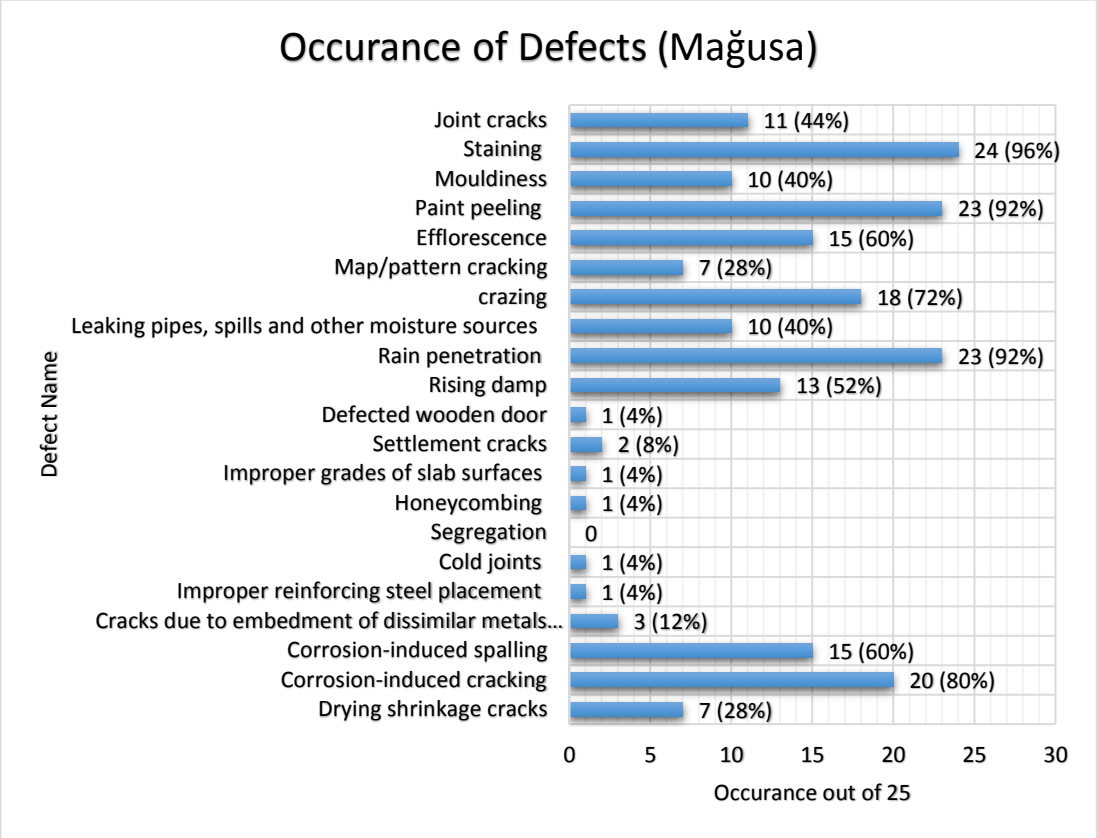


Figure 5.6: Bar Chart Showing the Occurrence of Defects in Mağusa District (M1-M25)

Mağusa had the highest percentage of crazing (72%). Besides, it had the highest corrosion-induced cracking and spalling with percentages of 80% and 60% respectively. This is reasonable since Mağusa's sample contained the most numbers of old buildings. Moreover it had the highest percentage of dampness due to leaking pipes, spills and other moisture sources (40%). This is reasonable since Mağusa's sample contained the highest number of apartments. On the other hand it had the lowest settlement cracks and rising damps (8% and 52% respectively).

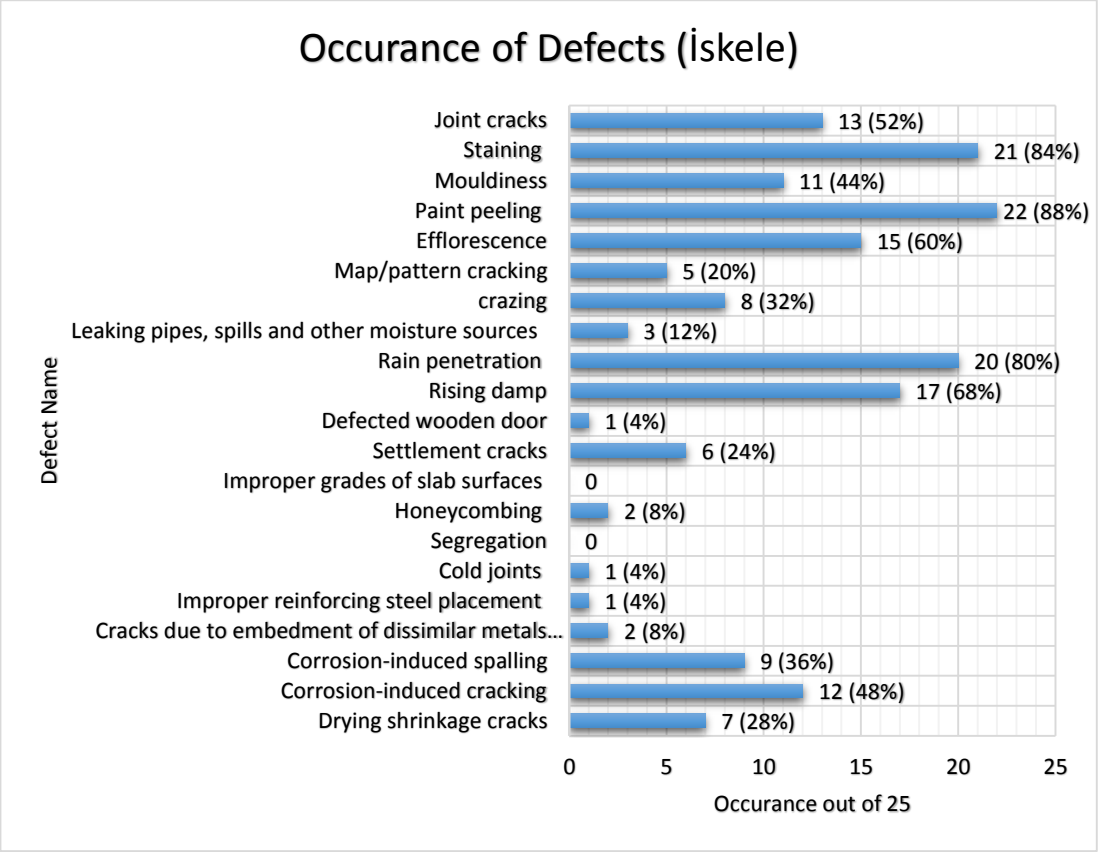


Figure 5.7: Bar Chart Showing the Occurrence of Defects in İskele District (İ1- İ25)

İskele had the highest percentage of settlement cracks (24%), but the lowest crazing and map/pattern cracking (32% and 20% respectively). Additionally, it had the lowest percentage of dampness due to leaking pipes, spills and other moisture sources (12%). This is reasonable since İskele's sample contained the least number of apartments.

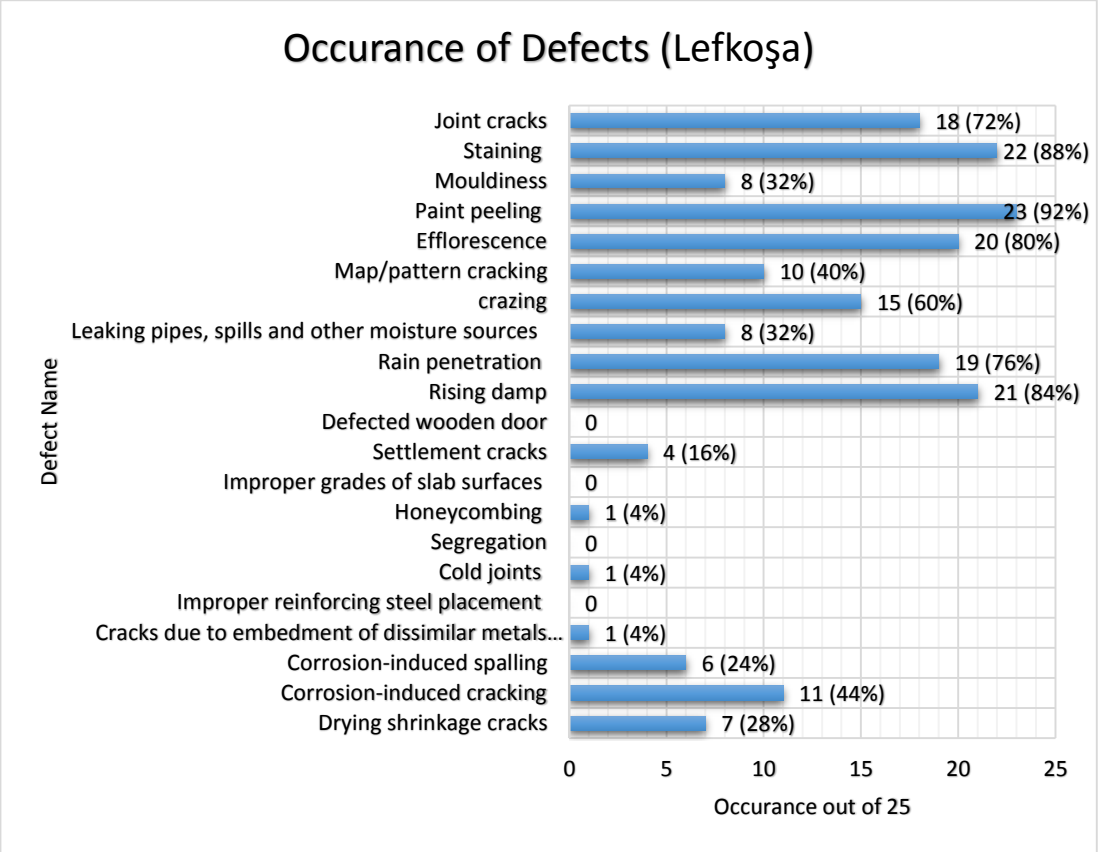


Figure 5.8: Bar Chart Showing the Occurrence of Defects in Lefkoşa District (L1-L25)

Lefkoşa had the least rain penetrations dampness (76%), besides the least corrosion-induced cracking with a percentage of 44%. This is reasonable since Lefkoşa is not a coastal city. However, it had the highest rising damp with a percentage of 84% and as a result the highest percentage of efflorescence with a percentage of 80%.

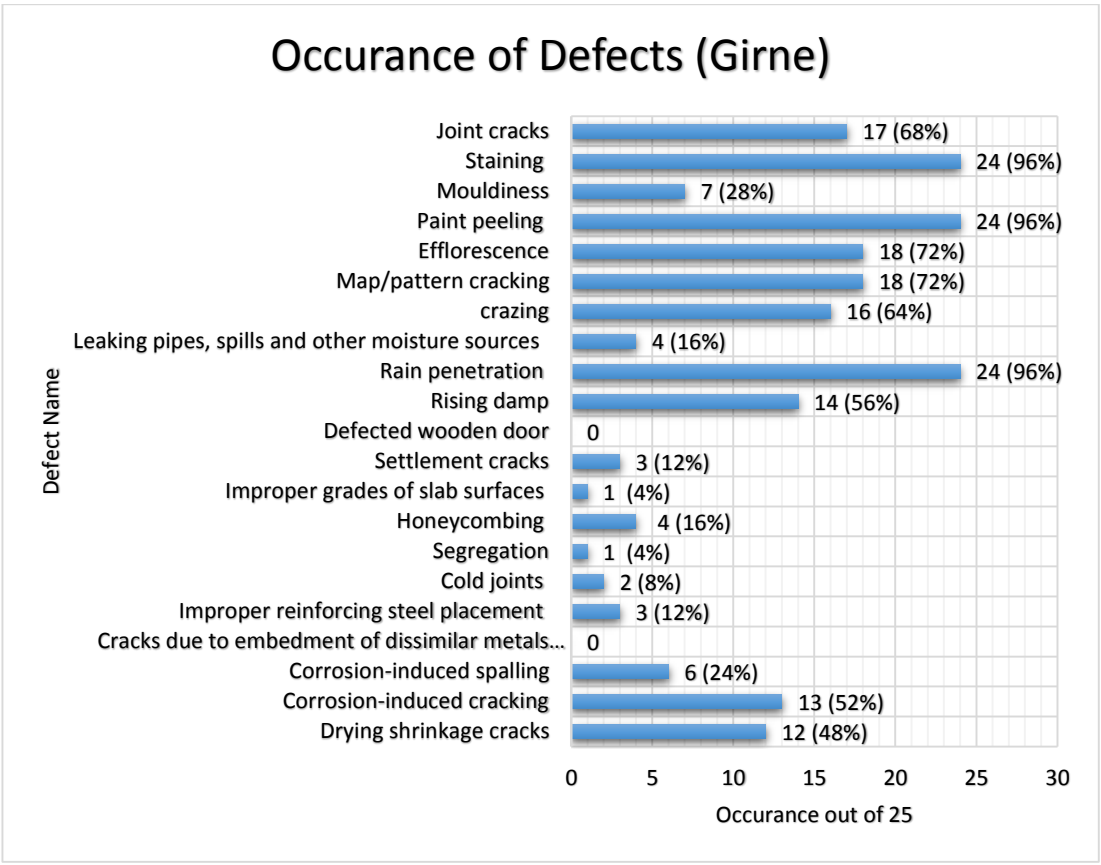


Figure 5.9: Bar Chart Showing the Occurrence of Defects in Girne District (G1-G25)

Girne had the highest drying shrinkage cracks with a percentage of 48% compared to 28% each for the other cities. Additionally, it had the highest rain penetration dampness with a percentage of 96%.

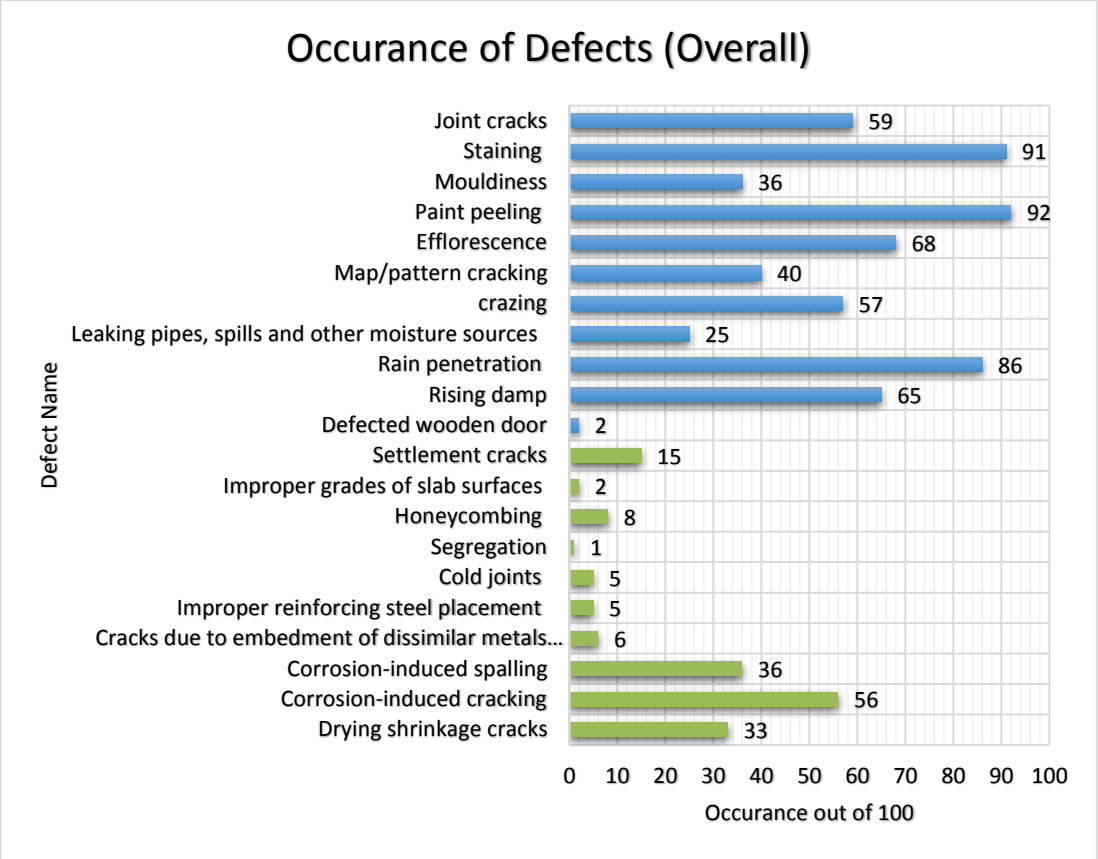


Figure 5.10: Bar Chart Showing the Overall Occurrence of Defects (M1-M25, İ1-İ25, L1-L25 and G1-G25)

Joint cracks and crazing were fairly evident in the building of the sample having percentages of 59 % and 57% respectively. On the other hand, map/pattern cracking was found to be less than crazing by having a percentage of 40% (compared to 57% for crazing).

The surface defects of staining and paint peeling were the most common defects found having percentages of 91% and 92% respectively. While segregation was the least common having a percentage of 1% each. The reason for this could be because segregation would be hard to detect in this sample since the buildings here are mostly completed so any form of segregation would be covered under finishes. However, they are much easier to detect in the buildings under construction sample (see section 5.5.2).

33% of the buildings had drying shrinkage cracks. 6% of the buildings were found to have cracks due to embedment of dissimilar metals which can be found around metal handrails. Corrosion-induced cracking were found to be in 56% of the building, while corrosion-induced spalling which can be consider as a severe of the former one were found to be at 36%. Mouldiness also shares the same percentage of corrosion-induced spalling (36%).

Efflorescence and one of its causes; rising damp, were found to be at 68% and 65% respectively. Dampness due to rain penetration was the most common type of dampness with a percentage of 86%. Dampness due to leaking pipes, spills and other moisture sources was found in quarter of the sample (25%). The structural cracks of settlement cracks were found in 15% of the building of the sample.

Honeycombing (8%), cold joints and improper reinforcing steel placement (5% each) are all construction defects. Therefore their detectibly if exited is difficult in such a sample of completed buildings as they would have been hidden under finishes. Finally, defected wooden doors and improper grades of slab surfaces were found in 2% only each of the buildings. The reason for this could be because in order to detect improper grades of slab surfaces, it must be raining during the day of inspection for water bonds to form.

5.5.1.4.1 Corrosion Statistics

First of all, it is noticeable that Lefkoşa had the least corrosion problems among the four district. This is understandable since it is the only non-costal (inland) districts in North Cyprus.

56% of the buildings in the sample had corrosion-induced cracks. However, what about the relation between the age of the building and corrosion? The following table can give us an idea of the chance of corrosion in relation to age.

Table 5.1: Relationship Between Corrosion and Age of Case Study

	Age Groups of Case Studies		
	>43 years old	Between 14 and 43 years old	<14 years old
Number of corroded buildings	19	33	4
Percentage of corroded building per age group	19 corroded out of 22 (86.36%)	33 corroded out of 60 (55.00%)	4 corroded out of 18 (22.22%)

It can be concluded from the table above that the older the building, the more it is prone to corrosion problems. One of the reasons for this could be because of the improvement of construction practice quality, such as the stop of usage of sea water, aggregate and sand as well as the improvement concrete quality used in construction in North Cyprus overtime. The factor of time should not be forgotten also, as corrosion develops and becomes more sever overtime.

5.5.2 Sample 2: Buildings Under Construction

Table 5.2: Statistics for the Under Construction Case Study Group (C1-C25)

	Under Construction Case Studies (C1-C25)		
	Defect or Design Fault *	**Number of Case Studies Involved (Out of 25 Total)**	**Percentage of Occurrence %**
Seismic Design Faults	Week column-strong beam	1	4.00%
	Torsional Irregularity (Torsion eccentricity)	3	12.00%
	Floor discontinuity	1	4.00%
	Non-continuous beams	12	48.00%
	Non-uniform beam span and cross-section	5	20.00%
	Absence of vertical support at beams intersection	1	4.00%
	Broken axis beams and frames	17	68.00%
	Over-stretched one-way slab	1	4.00%
	Poorly supported or heavily loaded cantilevered slabs	2	8.00%
	Inter-storey strength irregularity (Weak storey)	2	8.00%
	Inter-storey stiffness irregularity (Soft storey)	3	12.00%
	Discontinuity of columns or shear walls	1	4.00%
	Broken axis columns	2	8.00%
	Irregular column plan configuration	9	36.00%
	Short column	7	28.00%
Concrete Defects	Drying shrinkage cracks	2	8.00%
	Improper reinforcing steel placement	7	28.00%
	Cold joints	19	76.00%
	Segregation	3	12.00%
	Honeycombing	19	76.00%

* Not all are listed. Some concrete defects are hard to detect at the time of inspection. Additionally, some seismic design faults are hard to detect without the provision of plans and dimensions.

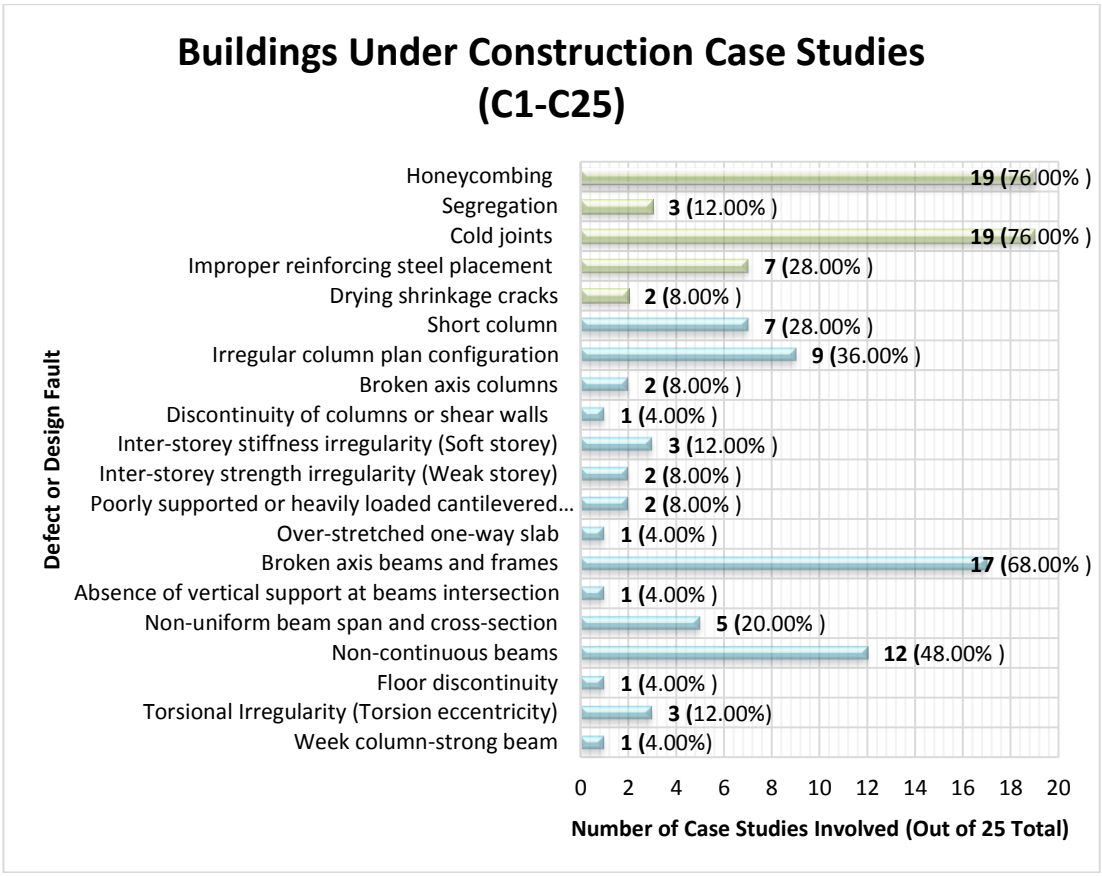


Figure 5.11: Bar Chart Showing the Statistics for the Under Construction Case Study Group (C1-C25)

The concrete defects of honeycombing and cold joint were found to be the most common defects among the under construction sample with a percentage of 76% each (nearly three quarters of the sample). The second common concrete defect was found to be the improper placement of reinforcing steel at 28% followed by segregation (12%) and drying shrinkage cracks (8%).

On the other hand, the most common design flaws were found to be related to beams; namely: broken axis beams at 68% followed by non-continuous beams at 48%. The third and fourth most common design flaws were related to columns; namely: irregular column plan configuration (36%) and short column (28%) respectively. Non-uniform beam span and cross-sections was found in 20% of the sample.

Torsional irregularity and soft storey were found in 12% each, while broken axis columns, weak storey and poorly supported or heavily loaded cantilevered slabs were found in 8% each. The least common design flaws were: floor discontinuity, discontinuity of columns or shear walls, over-stretched one-way slab and week column-strong beam which each of them were found in only 4% of the sample.

All of the building in this sample are younger than 14 years old except for two which are between 14 and 43 years old in which the sole case of week column-strong beam design fault was found in one of them.

Chapter 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

There are numerous problems in the process of constructing a safe and sustainable building in North Cyprus, such as, lack of site control or supervision, inexperienced, and unqualified workers employed in the construction industry, lack of soil investigation and lack of experienced and aware engineers and site control. These problems can be solved and avoided by considering the recommendations.

Training programs for workers can be very useful in assisting the quality control of construction. Water isolation problem can be solved by choosing the correct materials for isolation and construction. Seminars and conferences can help engineers, architects and other professionals in construction industry to be updated with design requirements, construction methods and applications. Having the necessary knowledge and awareness the people in the industry will be better qualified for designing and construction works which will be built to the required quality avoiding unnecessary construction problems.

Some owners tend to cut on the costs of construction control. The lack of construction control is one of the main reasons for the defects. Other reasons are: poor workmanship due to rapid construction and lack of qualified workers, inadequate material quality, environmental effects and lack of periodic maintenance.

On the other hand, as North Cyprus has poor building maintenance culture and concept, more awareness should be developed on the importance of good and systematic building maintenance. Maintenance of building is a complicated process and costly but if it is carried out wisely it could save money besides potential extended life span of the building. The maintenance process must involve two types of maintenance i.e. preventive maintenance and corrective maintenance, but it should always be minded that prevention is always better than cure. Architects, engineers, planners etc. should study the potential maintenance and operational problem before working out the design.

Owners should be aware of the importance of construction control as cutting the cost of construction control will later increase the repair and maintenance expenses. North Cyprus need major updates in quality control at all processes of construction. New rules and regulations restricting construction control should be added. Also, the variety of structural systems need to be increased to help in solving some of the problems by reducing the inadequate applications in construction industry by adding alternative systems, such as, pre-fabricated RC, pre-stressed RC and steel framed structures. However, qualified people and imported materials are required to design and construct such systems. Besides, it is very difficult to change the well settles long going construction culture in the country.

The following are the recommendations to overcome construction problems and inadequacies:

- Wrong detailing should be minimized or preferably avoided in projects.
- Inexperienced labourers should be trained according to their skills.

- Soil investigation should be carried out and the foundation design is bases on the results of soil investigation. Construction work should not start on site without any soil investigation.
- Design codes and good practice guide for construction should be informed.
- People involved in all levels of construction should have enough knowledge and experience about their work area and they should continuously develop themselves through the regularly hold seminars and training sessions.
- There should be stricter rules for better control of the design and construction process.

In addition, seismic design faults can lead to defects that can be brought out only after the event of an earthquake. Therefore, designers should be aware of them. The design of the structural system is a critical stage as it is decisive in the behaviour of the building during an earthquake. This thesis can act as a reference, especially for students, about building defects, seismic behaviour of RC buildings and common seismic design faults.

Nevertheless, there are noticeable improvements over time relating to building defects in North Cyprus. For example after using readily mixed concrete instead of on site mixed concrete, it can be said that the concrete quality improved. Also less intensity of corrosion cracks occurred in building after abandoning the usage of water, sand and aggregate from the sea in mixing concrete. Similarly, less seismic design faults are noticed in new buildings compares to old ones. For example, the weak column-strong beam design fault found only in a relatively older building.

6.2 Recommendations for Future Studies

This thesis was carried out by a solo researcher. It would be recommended for future studies to carry out similar researches carried by a team and covering larger number of case studies and including regions that have not been included in this thesis, such as the district of Güzelyurt and Lefke. It is also recommended for future research to be cooperated with some governmental authority to allow for the possibility of attaining detailed drawings and floor plans of case studies for more detailed data, identification and analysis of seismic design faults and other defects.

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APPENDIX

Appendix A: Case Study Checklist Sample

Case Study # ?

Profile

INSERT PROFILE PECTURE HERE

District:			
Area:			
Street name:			
Latitude:			
Longitude:			
Structure age:	<14 years	Date (if available):	
	Between 14 and 43 years (1974-2003)		
	>43 years (Before 1974)		
Building type:	Residential	Apartment	
		House	
		Dormitory	
	Public		
	Commercial		
Building status:	Under Construction		
	Occupied		
	Abandoned		

Reinforced Concrete Defects

Drying shrinkage cracks	
Corrosion of metals embedded in concrete	Corrosion-induced cracking
	Corrosion-induced spalling
	Cracks due to embedment of dissimilar metals (handrails)
Construction defects (faulty workmanship): designer, detailer, and contractor	Improper reinforcing steel placement
	Premature removal of forms
	Cold joints
	Segregation
	Honeycombing
	Improper grades of slab surfaces
Cracks in RC due to load effects (structural cracks)	Slab/beam-to column shear (punching shear) cracks
	Cantilevered member cracks
	Settlement cracks

Seismic Design Faults

Week column-strong beam			
Structural configuration	Horizontal structural configuration	Irregularity in plan	Torsional Irregularity (Torsion eccentricity)
			Floor discontinuity
			Projections in plan
		Beam elementary design faults	Non-continuous beams
			Non-uniform beam span and cross-section
			Absence of vertical support at beams intersection
			Broken axis beams and frames
		Slab elementary design faults	Over-stretched one-way slab
			Poorly supported or heavily loaded cantilevered slabs
	Pounding and separation problem		
	Vertical structural configuration	Irregularity in elevation	Weak storey
			Soft storey
			Discontinuity of columns or shear walls
		Vertical structural element elementary design fault	Broken axis columns
			Irregular column and/or shear-wall plan configuration
Short column			

Non-Structural Defects

Waterproofing defects, water leakage and seepage			
Defected wooden door			
Surface defects	dampness	Condensation	
		Rising damp	
		Rain penetration	
		Leaking pipes, spills and other moisture sources	
	Surface cracks on wall finishes	crazing	
		Map/pattern cracking	
	Efflorescence		
	Paint peeling		
	Mouldiness		
	Wall finishes workmanship problem		
	Staining		
Non-structural cracks	Joint cracks		

Other notes (if available):