TECHNICAL CHAMBER OF CYPRUS

Edition: **October 2023**

# RAPID VISUAL SCREENING OF BUILDINGS FOR POTENTIAL SEISMIC HAZARD FORM (R.V.S.B.)

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The initial edition was approved during the meeting of the Administrative Committee of ETEK on 18.12.2018.

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# Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form

## 1. INTRODUCTION

The Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form, has been prepared and published by the Scientific and Technical Chamber of Cyprus (ETEK) and provides a standardized methodology for the carrying out preliminary visual inspections on buildings for potential seismic hazard. At the same time, R.V.S.B. Form can serve as a tool for the development of an electronic buildings' identity register.

The Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form, forms part of the "Methodology for the Rapid Visual Screening of Buildings for Potential Seismic Hazard", also prepared and published by ETEK. The need for such a methodology is imperative and stems mainly from:

a. the fact that many of the existing buildings (of Cyprus) have issues with their structural and seismic capacity. This is mainly due to the fact that they were designed at time periods during which no anti-seismic regulations were implemented for the design of buildings and built at time periods during which there was lack of suitable materials for the construction of structural elements (e.g. lack of suitable gravel), the mandatory supervision of construction works had not been legally enforced, etc.

b. the lack of systematic maintenance of buildings as a preventive measure for ensuring the safety of building users and public safety.

**The Members of Committees, Civil-Structural Engineers, who prepared the "Methodology for the Rapid Visual Screening of Buildings for Potential Seismic Hazard" are:**

- Platonas Stylianou (Coordinator - 2018-2020 & 2020-2023)
- Nikolas Kyriakides
- Nikos Kalathas
- Paris Skouloukos (Coordinator - 2012-2017)
- Kleopas Papanikolaou
- Polydoros Polydorou
- Giorgos Karas
- Loukas Petrou
- Petros Christou
- Michalis Pittas
- Panayiotis Polykarpou
- Christakis Tyrimou
- Stelios Avraamides
- Yiannos Poumbouris (Revision - 2020-2023)
- Despina Hadjimarkou (Revision - 2020-2023)
- Irini Yiannakou (Revision - 2020-2023)

- Kyriakos Kyriakides (Revision - 2020-2023)
- Lydia Mina (Revision – 2020-2023 (Scientific Support))

It is noted that the above methodology is based on a report prepared by the initial "**ETEK BUILDINGS SAFETY Committee"**, composed of the following members:

- George Karas (Team Chairman for the preparation of the methodology (2008-2012))
- Loukas Petrou
- Dimitris Partellas
- Petros Christou
- Michalis Pittas
- Yannis Konstantinides
- Nikos Kalathas
- Paris Skouloukos

The initial committee used as a basis for its work the report of the Ad-hoc committee which was formed with the scope of preparing a proposal to the Government for the inspection of Public Buildings on 18/06/2008.

The initial committee examined the practices followed in other countries such as the USA and GREECE regarding the rapid visual screening of buildings for potential seismic hazard. In Greece, the Ministry of the Environment, Town and Country Planning and Public Works (ΥΠΕΧΩΔΕ) issued preliminary guidelines in 1997 on the subject of rapid visual screening of public use buildings for potential seismic hazard and commissioned the Earthquake Planning & Protection Organization ("E.P.P.O.") to prepare a relevant regulatory framework. In 2001, "E.P.P.O." issued relevant guidelines based on the FEMA (Federal Emergency Management Agency) methodology in force in the United States.

## 2. CARRYING OUT INSPECTIONS OF BUILDINGS WITH THE USE OF THE RAPID VISUAL SCREENING OF BUILDINGS FOR POTENTIAL SEISMIC HAZARD (R.V.S.B.) FORM

Guidelines for the completion of the Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form are provided in Appendix 1 of this document. If the building is being inspected for the first time, then the inspection should include both the R.V.S.B. form and the Visual Inspection Form (V.I.F.) which concerns the carrying out of visual inspections of the load-bearing and non-load bearing elements of a building. If a visual survey of the building has already been performed in the past, then the inspection is carried out using the Visual Inspection Form (V.I.F.) and, if deemed necessary, using the Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form.

**Note:** If the identified damages/defects are severe enough to be deemed of concern, then a more in-depth second level assessment (preliminary assessment of seismic vulnerability of buildings) and, possibly, a tertiary assessment (Assessment and Retrofitting of Buildings in accordance to Eurocode 8 Part 3) is required. Guidelines for carrying out secondary level and third level assessments of buildings are provided in the "Methodology of Rapid Visual Screening of Buildings for Potential Seismic Hazard" published by ETEK.

It is highlighted that carrying out inspections and visual checks on the load-bearing structure of a building using the V.I.F. and R.V.S.B. forms, is the first stage of a building's assessment based on the criteria set in the forms and it is not equivalent to assessing the load-bearing capacity and/or the structural capacity of the building. If this is required, it should be carried out in accordance with the requirements of Eurocode 8, Part 3 (CYS EN 1998-3:2005).

It is also noted that in case that during the visual inspection of a building with the use of the Buildings General Visual Inspection Form (B.G.V.I.F.) and or the use of the Visual Inspection Form (V.I.F.) visually apparent damages to the structural elements of the building are identified that are deemed to pose a safety hazard to the building occupants and passers-by, according to the judgement of the Inspecting Engineer, then the Inspecting Engineer is not permitted to proceed with further checks with the use of the Rapid Visual Screening of Buildings for Potential Seismic Hazard Form (R.V.S.B.) Form.

## 3. LAWS / INTERPRETATIONS

For the purposes of completing the R.V.S.B. form, the interpretation of "public building" as described in the Regulation of Streets and Buildings Law has been adopted, which includes the concepts of Public Building or Public Use Building (Annex 3).

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## RAPID VISUAL SCREENING OF BUILDINGS FOR POTENTIAL SEISMIC HAZARD FORM

### SECTION A: IDENTITY OF BUILDING

1. DISTRICT: ......................................................................................................................................

2. MUNICIPALITY/COMMUNITY: .............................Sheet/Plan: ......................... Block: ........ Parcel: ..................

3. ADDRESS: ......................................................................................................................................

..........................................................................................P.C. .......................... Tel.: ....................................

4. COMPLEX: ..................................................................... 4a. BUILDING: .........................................................

4b. GEOGRAPHICAL POSITION OF BUILDING (COORDINATES): X:............................................ Y:...............................

5. BUILDING USE: Initial .................................................. Current ..........................................................

6. USER: ......................................................................................................................................

7. OWNER: ......................................................................................................................................

8. CONTRACTING AUTHORITY: ......................................................................................................................

9. MAXIMUM NUMBER OF PERSONS OCCUPYING THE BUILDING:

UP TO 10 ☐ 10 - 100 ☐ >100 ☐ Estimated number of occupants ☐

### SECTION B: TECHNICAL INFORMATION OF THE BUILDING

10. NUMBER OF FLOORS: ....................................................... NUMBER OF BASEMENTS: ..............................

11. FLOOR PLAN AREA: ......................................................................................................................

12. TOTAL BUILT AREA: ......................................................................................................................

13. YEAR OF DESIGN: ......................................................................................................................

14. YEAR OF CONSTRUCTION: .................... 14a. YEAR OF LAST ADDITION/ EXTENSION: .................................

15. IS THE STRUCTURAL DESIGN/DRAWINGS AVAILABLE?.................. YES ☐ NO ☐

15a. IS THE GEOTECHNICAL STUDY OR THE GEOTECHNICAL CHARACTERISTICS OF THE SUBSOIL AVAILABLE?......................... YES ☐ NO ☐

16. HAS THE STRUCTURAL DESIGN BEEN USED FOR THE INSPECTION?...... YES ☐ NO ☐

17. IS THE BUILDING CLASSIFIED AS LISTED? .................................... YES ☐ NO ☐

18. HAS THE BUILDING BEEN REPAIRED/STRUCTURALLY UPGRADED? ............. ☐ YES ☐ NO

18a. IF YES, FOR WHAT REASON AND WHEN: ..........................................................................................

19. IMPORTANCE CLASS OF BUILDING PURSUANT TO CYS EN 1998-1:2004: I ☐ II ☐ III ☐ IV ☐

20. ADDITIONAL INFORMATION: ......................................................................................................

CYS EN 1998 = Eurocode 8 supplemented with the relevant Cyprus National Annexes

I: Buildings of Minor Importance II: Ordinary buildings III: Educational institutions, assembly halls
IV: Buildings whose integrity during earthquakes is of vital importance (i.e. Hospitals, Power Plants, Fire Stations etc.)

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## SECTION C: SEISMOLOGICAL AND GEOTECHNICAL DATA OF THE AREA

21. Seismic Zone based on CYS EN 1998

Z1 ☐ (0,15g) Z2 ☐ (0,20g) Z3 ☐ (0,25g)

22. Seismic Zone at the time of design of the building

Before 1994 ☐

After 1994 I ☐ II ☐ III ☐ IV ☐ V ☐

After 2012 Z1 ☐ Z2 ☐ Z3 ☐

23. Ground Classification (Ground Types) according to CYS EN 1998 (as classified according to Eurocode 8 and not according to the design)

A ☐ B ☐ C ☐ D ☐ E ☐ S1 ☐ S2 ☐

## SECTION D: STRUCTURAL TYPE OF BUILDING

24. Structural type of the building
(According to the attached Table 1)

ΟΣ1☐ ΟΣ2 ☐ ΟΣ3 ☐ ΟΣ4 ☐ ΟΣ5 ☐ ΟΣ6 ☐ ΟΣ7 ☐ ΟΣ8 ☐

ΠΟΣ1☐ ΠΟΣ2 ☐

ΑΤ1☐ ΑΤ2☐ ΔΤ☐ ΟΤ☐ ΕΤ☐

ΧΛ1α ☐ ΧΛ1β ☐ ΧΛ1γ☐ ΧΛ2α☐ ΧΛ2β☐ ΧΛ2γ☐ ΧΛ3α☐ ΧΛ3β☐ ΧΛ3γ☐ ΧΛ4☐

ΜΟΧ1 ☐ ΜΟΧ2☐ ΜΟΧ3 ☐

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## SECTION E: ELEMENTS OF VULNERABILITY

| | | YES | NO |
|---|---|---|---|
| 25. | Without any seismic provisions ............................................................................. | ☐ | ☐ |
| 26. | Did the importance class change due to a change in use? ............................... | ☐ | ☐ |
| 27. | Previous seismic damages .................................................................... | ☐ | ☐ |
| 28. | Poor condition due to poor maintenance/workmanship.................................... | ☐ | ☐ |
| 29. | Risk of pounding with adjacent buildings ....................................................... | ☐ | ☐ |
| 30. | Soft Storey.................................................................................................. | ☐ | ☐ |
| 31. | Irregular distribution of infill walls in plan ...................................................... | ☐ | ☐ |
| 32. | High Rise Building ........................................................................................ | ☐ | ☐ |
| 33. | Irregularity in elevation.................................................................................. | ☐ | ☐ |
| 34. | Irregularity in plan......................................................................................... | ☐ | ☐ |
| 35. | Risk of torsion.............................................................................................. | ☐ | ☐ |
| 36. | Short Columns.............................................................................................. | ☐ | ☐ |

## SECTION F: FINAL STRUCTURAL SCORE - AS DERIVED FROM TABLE 3

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## SECTION G: OBSERVATIONS/NOTES

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**SECTION H: FINDINGS**

Based on all of the above sections, and after having duly completed the attached Tables 2 and 3, the final structural score of the building is ……..

DETAILS OF INSPECTING CIVIL ENGINEERS:

| | |
|---|---|
| 1. SIGNATURE: ..................................................... | 2. SIGNATURE: ..................................................... |
| NAME: ................................................................ | NAME: ................................................................ |
| ETEK Member Registration Number: ....................... | ETEK Member Registration Number: ......................... |

27. DATE OF INSPECTION: ..........................................................................................................

**Note**: It is highlighted that carrying out inspections and visual checks on buildings with the use of the V.I.F. and R.V.S.B. forms is the first level of assessment of buildings for potential seismic hazard, according to the criteria set in the forms and is not equivalent to assessing the load-bearing capacity and/or structural capacity of the building, which if required should be carried out in accordance with the requirements of Eurocode 8, Part 3 (CYS EN 1998-3:2005).

**SECTION I: DANGEROUS BUILDINGS**

Is the building or part of it deemed dangerous to public safety? YES ☐ NO ☐

If the building is considered dangerous to public safety, the competent authority is informed so that the necessary actions pursuant to Articles 15, 15A and 15B of the Regulation of Streets and Buildings Law are taken.

**SECTION J: DECLARATION BY THE OWNER/AUTHORISED REPRESENTATIVE OF THE OWNER**

I, the undersigned ................................................., owner/authorised representative of the owner, declare that I have received a copy of this form, have studied and have understood its contents and the various findings will be taken into account in the building's maintenance program.

Signature ........................................

(Name) .....................................

Stamp

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**SECTION K: LIST OF ATTACHED DOCUMENTS/ DATA**

a) Photos

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b) Sketch

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c) Other documents/data

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# ANNEX 1

## “INSTRUCTIONS FOR THE COMPLETION  OF THE

## RAPID VISUAL SCREENING OF BUILINGS

## FOR POTENTIAL SEISMIC HAZARD (R.V.S.B.) FORM”

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# INSTRUCTIONS FOR THE COMPLETION OF THE RAPID VISUAL SCREENING OF BUILDINGS FOR POTENTIAL SEISMIC HAZARD (R.V.S.B.) FORM

## General

The **Rapid Visual Screening of Buildings for Potential Seismic Hazard Form** consists of five pages (see Annex 3) and three tables (see Annex 5).

- For each structurally independent building (not divided into smaller substructures by joints), only one Rapid Visual Screening of Buildings for Potential Seismic Hazard Form is completed.
- The Form is divided into eleven (11) sections, from A to K, explained below.

An "observations/notes" subsection is provided in most sections, where comments that are worth special mention or require further clarification can be included. Check boxes should be marked with X or √.

It is understood that the completion of the form, including assessing the building grading as per Tables 2 and 3 and assessing whether any damage/signs of deterioration or other issues identified during the visual inspection of the building are of concern or not, relies on the judgement of the Inspecting Engineer.

### Section A: Building Identity (1st page)

1. **District**
   No further explanation is required.

2. **Municipality/Community**
   Indicate the Sheet/Plan, the block and parcel.

3. **Address**
   The full postal address of the building, i.e. street, number, postcode, district and contact number of the owner or management committee is recorded. In the case that several autonomous Authorities occupy the building, it is useful to provide additional telephone numbers.

4. **Complex**
   Record the official name of the complex to which the building under inspection belongs to (where applicable).

**4a. Building**

Record the building's official name. If it forms part of a building complex, it should be made clear which building is of interest. If the building has no name, indicate the name of the Organisation/Authority that uses it or the name of the owner of the building.

**4b. Geographical Position of Building (Coordinates):**

The geographical coordinates (X, Y) for the position of the building are specified according to the Geodetic System ΚΓΣΑ93 (Ellipsoid: WGS84 (φ, λ) & Cartographic Projection: LTM 93). Geographical coordinates are obtained by locating the building's reference point on the orthophoto maps of the Department of Lands and Surveys web portal (DLS Portal). The building's reference point should be set as the building's main entrance or as the building's centre and correspondingly described in section "Additional Information" of the form (building's main entrance/centre). If the assigned geographical coordinates follow the WGS84 Geodetic Reference System, then their conversion to the ΚΓΣΑ 93 system is required. Coordinates (X, Y) should be recorded as integers, i.e. no digits should be included following the decimal point (i.e. X= 232996, Y=391676).

**5. Building use**

Record the initial use of the building (for which a permit was issued). Subsequently, indicate the current use of the building (in case the initial use has changed). If the building has more than one use, record the main one at the time of the inspection.

**6. User**

Record the Authority or private company that occupies the building. If the user is a natural person, the full name of the user is recorded.

**7. Owner**

Record the name of the Municipality/Community, the Ministry, the Public Authority etc., that owns the building. If the building is privately owned, indicate the name of the private company or the full name of the owner, in case the building is owned by a natural person.

**8. Contracting Authority**

No further explanation is required.

**9. Maximum number of persons occupying the building**

Check the box that corresponds as closely as possible to the maximum number of persons normally occupying the building. For a number of persons exceeding 100, the number of occupants should be estimated and indicated in the corresponding box.

## Section B: Technical Information of the Building (1st page)

**10. Number of floors / basements**

Record the number of floors of the building (e.g., ground floor + 3) and the number of basements. Any kind of structure whose purpose is to enclose the staircase landing above roof level does not count towards the number of floors. In case of sloping ground surface, record the number of floors from the lowest ground surface point. A floor is considered to be a basement if it is predominantly below ground and is adequately encased in perimeter walls.

**11. Floor plan area**

Record the area most representative of the building's floor plan. If no drawings are available, the floor plan area should be measured on site and estimated.

**12. Total built area**

Record the total area of the building which results from the summation of the above-ground floor areas, including the ground floor (excluding basements, mezzanines, flat roofs, balconies, covered areas with pergolas, etc.). If no drawings are available, the total area of the building is estimated and a relevant note is made in the "additional information" subsection.

**13. Year of Design**

Record the year the building's structural design (if any) was carried out.

**14. Year of construction**

Record the year of the building's construction, based on information or its structural characteristics.

This information is particularly useful and crucial in deciding whether a more in-depth investigation is required. Therefore, every effort should be made to identify the building's year of construction.

If an exact date cannot be identified, recording of a broader reference period (e.g. 1933 - 1937) is allowed, even by approximation.

**14a. Year of last addition/extension**

Record the year of the last addition/extension to the building. If during the construction of the additions or extensions, the building was structurally upgraded, this must be indicated in the fields with number 18 and 18a of the form.

This field refers to vertical additions or horizontal extensions structurally connected to the existing structure.

It should be noted that this field seeks to establish whether the additions/extensions to the existing building were, either as provided for in the original design, or by an assessment of the load-bearing capacity of the building according to more recent regulations to those used in the original study.

**15. Availability of Structural Design Report/Structural Drawings**

The structural design (drawings/report) of the building can be obtained from records of the Authority that issued the building permit or from the owner.

Where limited information (usually drawings) is available, YES or NO is marked, depending on the available information.

**16. Has the structural design been used for the inspection?**

No further explanation is needed.

**17. Is the building classified as a Listed?**

Record whether the building has been classified as listed.

**18. Has the building been repaired/structurally upgraded?**

If the building has undergone structural interventions for either repair or for structural upgrading, the corresponding box should be marked with an X or √.

Note: Of particular interest are the cases where buildings were designed without seismic regulations, which have undergone repair and structural interventions to restore their load-bearing capacity or for the addition of floors; as well as where interventions were carried out in order to repair damages (e.g. caused by earthquakes) or for the addition of floors according to earthquake regulations subsequent to those implemented (if any) in the original study.

**18a. If yes, for what reason and when?**

For example, reasons might include repair due to deterioration, or restoration of damage caused by earthquakes or differential settlement, or structural upgrading as a result of the addition of floors to the building, etc.

**19. Importance Class of building pursuant to CYS EN 1998-1:2004**

No further explanation is required.

**20. Additional Information**

This part of the form is intended for any comments or observations of the Inspecting Engineer in relation to the building, its use, the condition and reliability of the information or any other information deemed necessary to be reported.

## SECTION C: Seismological and Geotechnical Data of the Area (2nd page)

**21. Seismic zone based on CYS EN 1998**

Record the building's seismic zone.

**22. Seismic zone at the time of design of the building**

Record the seismic zone the building falled into at the time of its structural design, according to pertinent Regulations in force at the time. For buildings which were designed before 1994, without the implementation of seismic regulations, no mark should be filled in at the check boxes. In such a case only the check box of field number 25 should be checked.

**23. Ground Classification (Types) according to CYS EN 1998**

Record the ground's classification (ground type), that was considered in the building structural report (given the report is available) or, if it is not available, the ground type estimated by the inspecting Engineers.

## Section D: Structural Type of Building (2nd page)

**24. Structural type of the building**

For the completion of this part of the form, TABLE 1, Annex 5 should be consulted beforehand, in order to determine the structural type in which the building under consideration corresponds to the most.

It should be emphasized that for each case, only one structural type may be indicated. For buildings that their structural type cannot be clearly defined, they shall be classified under their nearest structural type, with an asterisk and relevant comments in the observations field.

## Section E: Elements of Vulnerability (3rd page)

The completion of this section should be done with due care, taking into account the information provided in paragraphs 25-36 and the corresponding structural characteristics of the building. The grades given should reflect as much as possible the building's actual condition, since higher values reduce the overall "grade" of the building, thus increasing its vulnerability.

**25. Without Seismic Regulation**

No further explanation is required.

**26. Has the importance class changed due to the change of use?**

The importance class of the building is not rated but denoted so that it is taken into account when establishing priorities for the various repair/structural upgrading interventions to the building.

**27. Previous seismic damage (not restored or poorly restored)**

The corresponding box is marked to indicate whether or not the building has suffered any damage to its load-bearing structure from previous earthquakes and whether they were adequately addressed based on a valid structural repair design.

**28. Poor condition due to poor maintenance/ workmanship**

The corresponding check box is marked to indicate whether or not the building is deemed to be in a poor state of repair due to substandard maintenance or workmanship.
Indicative examples of what is considered as poor state are:

- Apparent presence of poor concrete quality or exposed and/or corroded reinforcement.
- Apparent defects in the load-bearing structure.
- Visibly weak mortar in masonry buildings.
- Cracks in general.
- Cracks caused by settlement.

A detailed inspection of the building is required to identify any damages/defects.

**29. Risk of pounding with adjacent buildings**

The corresponding check box is marked to indicate whether or not there is a risk of pounding between adjacent buildings.
Indicative examples include the following:

- Cases where there is a possibility of lateral impact in the middle of the columns of one building from the structural elements of another, such as adjacent buildings with a large difference in floor height.
- Cases where there is a large difference in stiffness between two adjacent buildings.
- Cases of adjacent buildings at a corner.

This criterion mainly concerns reinforced concrete buildings (conventional or pre-cast) in contact with other buildings.
When there is a sufficient seismic joint, adjacent buildings are considered to be separate. For adjacent buildings, where there is no possibility of lateral impact of the columns of any building apart from the floor level, the width of the joint (unless a more precise calculation is made) can be roughly determined as 0,65 % of the height of the building.

**30. Soft storey**

The corresponding check box is marked to indicate the existence or lack of a soft storey in the building.
The term "soft storey" refers to a level of a building that appears to have a significantly reduced stiffness or resistance to lateral loads compared to the other floors/storeys of the building.

The most common cases of a soft storey are the "pilotis" (ground level with significantly less infill walls than the floors above usually used for parking). However, the ground floor is also considered a soft storey if there are minimal or no masonry infill walls. It is noted that there are cases where it is difficult to identify the existence of a soft storey. When in doubt, the worst case scenario should be noted.

**31. Irregular distribution of infill walls in plan**

The corresponding check box is marked to indicate the absence or irregular

arrangement of infill walls in the building's plan.
This attribute mainly concerns buildings with a reinforced concrete load-bearing structure.
The existence of regularly distributed strong infill walls (masonry walls $\geq$ 20 cm of thickness or with few openings) contributes positively to the seismic behaviour of these buildings. Masonry walls are regarded as regularly distributed if they are almost symmetrically distributed on each floor (in plan) and throughout the height of the building (in elevation). Otherwise, their distribution should be denoted as irregular.
If a floor of the building has been classified as a soft storey due to the absence of infill walls (i.e. "pilotis"), the corresponding check box should not be marked.

## 32. High-rise building

The corresponding check box is marked if the building is of great height.
For the purposes of this procedure, structures made of load-bearing masonry or pre-cast structural elements are considered to be high-rise when they are more than two storeys high. Additionally, buildings with a Reinforced Concrete (RC) structure are considered to be high-rise when they exceed five stories.

## 33. Irregularity in Elevation

The corresponding check box is marked to indicate the existence or lack of irregularity in the elevation of the building.

A building that has recesses (setbacks) or "towers", i.e. storeys with a plan area of less than 70% of the plan area of the other floors, is considered to be irregular in elevation.

Any kind of structure whose purpose is to enclose the staircase landing above the roof level shall not be taken into account.

In addition, buildings are considered to be irregular in elevation if, due to sloping ground level, there is a height difference between the lower and upper floor of more than one storey and this storey is not encased.

## 34. Irregularity in Plan

The corresponding check box is marked to indicate the existence or lack of irregularity in plan of the building.

Indicative examples of buildings that are irregular in plan are the following:

- Buildings whose exterior sides intersect at acute angles.
- Buildings with complex shapes such as L, E, Π, T and with excessive wing length.
- Buildings with larger length in relation to their width such as buildings with side ratio greater than 4 (it is reiterated that the Cyprus Anti-Seismic Regulations (K.A.K.) recommended avoiding floor plans with a side ratio greater than 4).

**35. Risk of Torsion**

The corresponding check box is marked to indicate whether or not there is a probability of significant torsional deformation in the building, due to significant eccentricities in the load-bearing structure.

The likelihood of severe torsional deformation in the building exists when the distribution of the vertical load-bearing elements (columns and/or walls) is asymmetrical and/or away from the perimeter.

It is reminded that the anti-seismic code (K.A.K.) recommended a symmetrical distribution of vertical elements and stiffness near the perimeter or, where this is not possible, the code recommends that wall distribution is parallel and close to at least three sides of the perimeter.

**36. Short columns**

The corresponding check box is marked to indicate the existence or lack of short columns in the building.

Short columns are defined as columns (not walls) in which the ratio of their effective length (height) to their maximum lateral dimension is less than or equal to 2.0 (effective length/maximum dimension ≤ 2.0).

The most common examples of short columns are floors with windows at the top of the walls or columns that are tangential to infill walls with openings that do not extent to the columns full height.

## Section F: Final Structural Score (3rd page)

The final Structural Score of the building, as derived from Table 3, is recorded and compared to the value 2.0 and any relevant comments are denoted.

## Section G: Observations/Notes (3rd page)

This part of the form is intended for any comments or observations of the Inspecting Engineer with respect to the building's condition, its use, the reliability of information provided, the recording of anything that may require special mention or clarification and any other information deemed necessary to be reported.

## Section H: FINDINGS (4th page)

No further explanation is required.

## Section I: DANGEROUS BUILDINGS (4th page)

Record whether the building is considered dangerous to public safety based on the inspections carried out. If the building is deemed dangerous, the competent authority is informed so that the necessary actions pursuant to Articles 15, 15A and 15B of the Regulation of Streets and Buildings Law are taken.

## Section J: Declaration by the Owner/Authorised Representative of the Owner (4th page)

No further explanation is required.

## Section K: List of attached documents/data (5th page)

**a) Photos**

As a rule, a photograph of the building's façade is necessary to identify the building. It is recommended that it is taken from a sufficient distance so that the whole building façade is included. It is advisable to avoid depicting trees, vehicles or other objects that obscure the lowest (usually critical) floor. In exceptional cases, at the discretion of the authors of the form (i.e. due to signs of poor workmanship, corrosion of reinforcements, etc.), additional photographs may be attached. Photographs must be in digital form, so that they can be managed electronically. The photographs should be in .jpg file format and of 640x480 pixel resolution.

**b) Sketch**

If the authors of the form consider it useful to attach a sketch depicting part or the whole of the building, they may do so.

**c) Other documents/data**

Any other documents or information that are deemed appropriate to be attached to the form should be recorded.

## Explanation for the use of attached Tables 1-3

**a) Table 1: Structural types of buildings**

This table describes in detail the different structural types of buildings.
Section D on the 2nd page of the Rapid Visual Screening of Buildings for Potential Seismic Hazard (R.V.S.B.) Form should be completed after first studying the above table.
The classification of a building is made according to the materials used for its construction, its structure and the regulation / design code according to which it has been designed / analysed.

**b) Table 2: Initial and basic seismic hazard score of structural types**

Once the R.V.S.B. form has been completed and after a study of this table has been carried out, then, depending on the structural type of the building (as classified in Section D of the R.V.S.B. form), the seismic zone (as stated in field 21 of Section C of the "R.V.S.B." form) and the basic structural characteristics ("Pilotis" and/ or short columns as per fields 30 and/or 36 in Section E of the R.V.S.B. form, regular or irregular infill wall distribution as per field 31 of the same section), the initial score that corresponds to each of the table's columns should be circled. By summing horizontally the individual columns' scores, the Basic Seismic Risk Score (BSRS) is derived.

c) **Table 3: Structural scores and Modifying Factors**

On the first row of the table indicate the Basic Seismic Risk Score (BSRS), as derived from Table 2, depending on the structural type of the building.

Then, based on the structural type of the building and the fields completed in Section E and field 23 of Section C of the R.V.S.B. form, but also on on-site observations, circle vertically the reduction factors. By vertically summing the reduction factors, the final structural score is derived.

The final structural score (S) expresses the $10^{-S}$ probability that the building under consideration will be severely damaged or will collapse in the design earthquake event. When the score is greater than or equal to 2.0 (in which case the probability of the building suffering severe damage or collapse is less than or equal to $10^{-2}$ or 1%), then it is considered to be satisfactory, whereas when the score is less than 2, then further investigation/assessment of the building is required. It should be noted that based on the values of the reduction factors in Table 3, it is possible to obtain a negative final structural score. In this case, zero should be considered as the final structural score (therefore, according to the R.V.S.B. form, the probability of the building suffering severe damage or collapse is 1.0).

# ANNEX 2

## “R.V.S.B. TABLES”

**Table 1**

# STRUCTURAL TYPES OF BUILDINGS

(R.V.S.B.)

| | STRUCTURAL TYPE | DESCRIPTION OF STRUCTURAL CHARACTERISTICS | DESIGN REGULATIONS |
|---|---|---|---|
| REINFORCED CONCRETE | **ΟΣ1** | Building with a reinforced concrete moment frame | Without any seismic provisions |
| | **ΟΣ2** | Building with a reinforced concrete dual system | Without any seismic provisions |
| | **ΟΣ3** | Building with a reinforced concrete dual system in accordance with the temporary seismic measures | Temporary seismic measures (1986 - 1992) |
| | **ΟΣ4** | Building with a reinforced concrete moment frame structure | Period of coexistence of temporary anti-seismic measures and the K.A.K. (1992-1994) |
| | **ΟΣ5** | Building with reinforced concrete dual system | Period of coexistence of temporary measures and the K.A.K. (1992-1994) |
| | **ΟΣ6** | Building with reinforced concrete moment frame structure | K.A.K. (After 01.01.1994)<br>K.Ο.Σ. (After 01.06.1995) |
| | **ΟΣ7** | Building with reinforced concrete dual system | K.A.K. (After 01.01.1994)<br>K.Ο.Σ. (After 01.06.1995) |
| | **ΟΣ8** | Building designed according to the Eurocodes | After 01/01/2012 |
| MIXED BUILDING SYSTEM | **ΜΟΧ1** | Building with reinforced concrete vertical structural elements and a steel roof | Without any seismic provisions |
| | **ΜΟΧ2** | Building with reinforced concrete vertical structural elements and a steel roof | K.A.K. (After 01.01.1994)<br>K.Ο.Σ. (After 01.06.1995) |
| | **ΜΟΧ3** | Building with reinforced concrete vertical structural elements and a steel roof | After 01/01/2012 |
| PRECAST | **ΠΟΣ1** | Buildings with precast reinforced concrete frame structure | |
| | **ΠΟΣ2** | Buildings with precast reinforced concrete walls | |

| | | | |
|---|---|---|---|
| LOAD-BEARING MASONRY | **AT1** | Buildings made with load-bearing unreinforced wall structure mainly with masonry walls (uncarved or semi-carved stones), without tie beams or floor diaphragms and a timber roof | |
| | **AT2** | Buildings made with load-bearing unreinforced wall structure mainly with masonry walls and with floor diaphragms | |
| | **ΔT** | Buildings made with load-bearing unreinforced wall structure mainly with masonry walls, (uncarved or semi-carved stones) and with tie beams and floor diaphragms | |
| | **OT** | Buildings made with load-bearing reinforced masonry structure, mainly of contemporary type wall reinforced with horizontal and vertical steel bars and floor diaphragms with or without tie beams | |
| | **ET** | Buildings made with load-bearing unreinforced masonry structure, repaired and reinforced with tie beams, floor diaphragms and properly tied and connected to the foundations single-sided and double-sided RC jackets. | |
| | **Notes:**<br>1. Tie beams are defined as horizontal <u>and</u> vertical RC structural elements (tie-beams and tie-columns), with strong connections with walls in accordance with modern concepts and codes' requirements/provisions for walls with interconnecting tie beams. | | |
| STEEL STRUCTURES | **ΧΛ1α** | Single-storey frame steel structure buildings with light cladding on it's horizontal and vertical surfaces (such as industrial buildings and storage sheds) | Without the implementation of a seismic code |
| | **ΧΛ1β** | | Seismic action according to K.A.K. |
| | **ΧΛ1γ** | | EC8 |
| | **ΧΛ2α** | Single-storey or two-storey frame steel structure buildings in both directions with diaphragms (concrete diaphragms or horizontal bracings) and with or without vertical bracing between frames | Without the implementation of a seismic code |
| | **ΧΛ2β** | | Seismic action according to K.A.K. |
| | **ΧΛ2γ** | | EC8 |
| | **ΧΛ3α** | Multi-storey steel structure buildings with diaphragms (concrete diaphragms or horizontal bracings) that act as spatial frames and/or with | Without the implementation of a seismic code |
| | **ΧΛ3β** | | Seismic action according |

| | | | |
|---|---|---|---|
| | | vertical bracings for lateral stability | to K.A.K. |
| | **ΧΛ3γ** | | EC8 |
| | **ΧΛ4** | Steel structure buildings with concrete walls and/or concrete cores for receiving the seismic action. | Such buildings should be classified in accordance with the above mentioned corresponding reinforced concrete dual systems building types. |

K.A.K. Cyprus Earthquake Regulation
K.O.Σ. Code for Reinforced Concrete
EC 8 Eurocode 8

## Table 2

# INITIAL AND BASIC SEISMIC RISK SCORE FOR BUILDING TYPES

**(R.V.S.B.)**

| | Structural System Type (Table 1) | Initial Score (ISHS) | Seismic Zone according to Eurocode 8 | | Basic Structural Characteristics | | Basic Score (BSRS) |
|---|---|---|---|---|---|---|---|
| | | | Z1-Z2 | Z3 | Soft Storey and/or short columns | Regular Infill Wall Distribution | |
| **REINFORCED CONCRETE** | ΟΣ1 | 3.0 | -0.3 | -0.5 | -1.5 | 0.5 | |
| | ΟΣ2 | 3.5 | -0.7 | -1.0 | -1.5 | 0.5 | |
| | ΟΣ3 | 4.0 | -0.7 | -1.0 | -1.0 | -- | |
| | ΟΣ4 | 4.0 | -0.7 | -1.0 | -1.5 | 0.5 | |
| | ΟΣ5 | 4.0 | -0.7 | -1.0 | -0.5 | 0.5 | |
| | ΟΣ6 / ΟΣ7 | 5.0 | -0.3 | -0.5 | -0.5 | -- | |
| | ΟΣ8 | 5.5 | -0.3 | -0.5 | -0.5 | -- | |
| **MIXED STRUCTURAL SYSTEM** | ΜΟΧ1 | 3.5 | -0.7 | -1.0 | -1.5 | -- | |
| | ΜΟΧ2 | 5.0 | -0.3 | -0.5 | -0.5 | -- | |
| | ΜΟΧ3 | 5.5 | -0.3 | -0.5 | -0.5 | -- | |
| **PRECAST STRUCTURE** | ΠΟΣ1 | 2.0 | -0.3 | -0.5 | -0.5 | -- | |
| | ΠΟΣ2 | 3.5 | -0.7 | -1.0 | -- | -- | |
| **LOAD-BEARING MASONRY** | ΑΤ1 | 2.5 | -0.3 | -0.5 | -- | -- | |
| | ΑΤ2 | 3.0 | -0.3 | -0.5 | -- | -- | |
| | ΔΤ | 3.5 | -0.3 | -0.5 | -- | -- | |
| | ΟΤ | 4.0 | -0.3 | -0.5 | -- | -- | |
| | ΕΤ | 3.5 | -0.3 | -0.5 | -- | -- | |
| **STEEL STRUCTURES** | ΧΛ1α | 5.0 | -0.3 | -0.5 | -- | -- | |
| | ΧΛ1β | 6.0 | -- | -0.3 | -- | -- | |
| | ΧΛ1γ | 7.0 | -- | -- | -- | -- | |
| | ΧΛ2α | 3.5 | -0.5 | -0.7 | -1 | 0.5 | |
| | ΧΛ2β | 5.0 | -0.3 | -0.5 | -0.5 | 0.5 | |
| | ΧΛ2γ | 6.0 | -- | -0.3 | -0.5 | 0.5 | |
| | ΧΛ3α | 3.0 | -0.7 | -1 | -1.5 | 0.5 | |
| | ΧΛ3β | 4.5 | -0.5 | -0.7 | -1 | 0.5 | |
| | ΧΛ3γ | 5.5 | -0.3 | -0.5 | -0.7 | 0.5 | |
| | ΧΛ4* | For the scoring of building type ΧΛ4, the corresponding scoring for building types with reinforced concrete walls applies. | | | | | |

**Table 3**
**STRUCTURAL SCORES AND MODIFYING FACTORS**

| S/N | STRUCTURAL TYPE (see Table 1) | REINFORCED CONCRETE | | | | | | | MIXED STRUCTURAL SYSTEM | | | PRECAST STRUCTURE | | LOAD-BEARING MASONRY | | | | STEEL STRUCTURES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ΟΣ1 | ΟΣ2 | ΟΣ3 | ΟΣ4 | ΟΣ5 | ΟΣ6/ ΟΣ7 | ΟΣ8 | ΜΟΧ1 | ΜΟΧ2 | ΜΟΧ3 | ΠΟΣ1 | ΠΟΣ2 | ΑΤΙ/2 | ΔΤ | ΟΤ | ΕΤ | ΧΛ1α ** | ΧΛ1β ** | ΧΛ1γ ** |
| **1.** | **Basic Seismic Risk Score** (as provided for in Table 2) | | | | | | | | | | | | | | | | | | | |
| **2.** | **Reduction factor** | (Circle those applicable to the building under study) | | | | | | | | | | | | | | | | | | |
| **2.1** | Without Seismic Provisions | -0.5 | -0.5 | -- | -- | -- | -- | -- | -0.5 | -- | -- | -- | -- | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -- | -- |
| **2.2** | Poor Condition | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 |
| **2.3** | Previous seismic damages | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -0.5 | -0.5 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 |
| **2.4** | High Rise | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -1.0 | -- | -- | -- |
| **2.5** | Irregularity in Elevation | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -0.5 | -0.5 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -- | -- | -- |
| **2.6** | Irregularity in Plan | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -0.5 | -0.5 | -1.0 | -1.0 | -1.0 | -1.0 | -1.0 | -1.0 | -- | -- | -- |
| **2.7** | Risk of Torsion | -0,5 | -0,5 | -0,5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -1.0 | -1,0 | -1,0 | -1,0 | -1,0 | -0.5 | -0.5 | -- |
| **2.8** | Soft storey and/or short columns | -0,5 | -0,5 | -0,5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -1.0 | -1.0 | -1,0 | -1,0 | -1,0 | -1,0 | -- | -- | -0.5 |
| **2.9** | Pounding with adjacent buildings | -0,5 | -0,5 | -0,5 | -0.5 | -0.5 | -- | -- | -- | -- | -- | -0.5 | -0.5 | -- | -- | -- | -- | -- | -- | -- |
| **2.10** | Heavy cladding | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -1.0 | -1.0 | -1.0 |
| **2.11** | Ground Type S1 | -0.3 | -0.3 | -0.3 | -0,3 | -0,3 | -0,3 | -0,3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |
| **2.12** | Ground Type S2 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 |
| **2.13** | Ground type S2 and more than 5 above ground storeys | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -- | -- | -- |
| **2.14** | Importance Class III and IV Buildings (EC8) | -0.5 | -0.5 | -0.4 | -0.3 | -0.2 | -0.2 | -0.2 | -0.4 | -0.2 | -0.2 | -0.2 | -0.2 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.3 | -0.2 |
| **3.** | **FINAL STRUCTURAL SCORE** [1 - Total 2 (circled)]) | | | | | | | | | | | | | | | | | | | |
| | **IMPORTANCE FACTOR OF STRUCTURE** | | | | | **SEISMIC ZONE AT THE TIME OF CONSTRUCTION OF THE BUILDING** | | | | | | | | | | | | | | |
| | **As an exception, reduction factors will be taken into account for building types ΧΛ1α, ΧΛ1β and ΧΛ1γ (-1.0, -1.0, 0.0 correspondingly) due to wind load being the critical horizontal load in such structural systems. | | | | | | | | | | | | | | | | | | | |

## Table 3 (Continued)
## STRUCTURAL SCORES AND MODIFYING FACTORS

| S/N | STRUCTURAL TYPE (see Table 1) | STEEL STRUCTURES (Continued) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **XΛ2α** | **XΛ2β** | **XΛ2γ** | **XΛ3α** | **XΛ3β** | **XΛ3γ** | **XΛ4*** |
| **1.** | **Basic Seismic Risk Score** (as provided for in Table 2) | | | | | | | |
| **2.** | **Reduction factor** | (Circle those applicable to the building under study) | | | | | | |
| **2.1** | Without Seismic Provisions | -0.5 | -- | -- | -0.7 | -- | -- | |
| **2.2** | Poor Condition | -1.0 | -0.5 | -0.5 | -1.0 | -0.7 | -0.7 | |
| **2.3** | Previous seismic damages | -0.5 | -0.5 | -0.5 | -1.0 | -0.5 | -0.5 | |
| **2.4** | High Rise | -- | -- | -- | -1.0 | -0.5 | -0.5 | |
| **2.5** | Irregularity in Elevation | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | |
| **2.6** | Irregularity in Plan | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | |
| **2.7** | Risk of Torsion | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | |
| **2.8** | Soft storey and/or short columns | -0.5 | -0.5 | -0.5 | -0.7 | -0.7 | -0.7 | |
| **2.9** | Pounding with adjacent buildings | -0.3 | -0.3 | -0.3 | -0.5 | -0.5 | -0.5 | |
| **2.10** | Heavy cladding | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | |
| **2.11** | Ground Type S1 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | |
| **2.12** | Ground Type S2 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | |
| **2.13** | Ground type S2 and more than 5 above ground storeys | -- | -- | -- | -0.8 | -0.8 | -0.8 | |
| **2.14** | Importance Class III and IV Buildings (EC8) | -0.5 | -0.3 | -0.2 | -0.5 | 0.3 | -0.2 | |
| **3.** | **FINAL STRUCTURAL SCORE** [1 - Total 2 (circled)]) | | | | | | | |
| | *For the scoring and reduction factors of building type XΛ4, the corresponding scoring for building types with reinforced concrete walls applies. | | | | | | | |
| | **For the scoring and reduction factors for building type XΛ4, the corresponding scoring and reduction factors for building types with reinforced concrete walls should be taken into account. | | | | | | | |

# ANNEX 3

## “STREETS AND BUILDINGS REGULATION REGULATIONS”

# LAW/REGULATIONS: THE STREETS AND BUILDINGS REGULATION

# REGULATIONS PART I, ARTICLE 2

**Public building or public use building**

The term "Public building" or "public use building" is deemed to refer to buildings where a larger than the normal number of people assemble (the use of a building as a residence is equivalent to ordinary use).

For the purposes of the work of the present Committee on "Regular Inspection of Structures", the term public buildings or public use buildings, and in accordance to the basic Regulations of the Regulation of Streets and Buildings Law, shall cover at least the following buildings:

a) Buildings of Public Worship: churches, chapels, mosques and other places of public worship.

b) Teaching Facilities: universities, colleges, schools, after-school educational establishments, public lecture halls.

c) Entertainment buildings: (with a main hall area greater than $100m^2$), theatres, restaurants or cafes, public concert halls, public dance halls, public exhibition halls or places of public assembly (including stadiums).

d) Hotels with more than eight (8) rooms and a volume greater than 1400 cubic meters.

e) Hospitals, clinics, charitable institutions and other healthcare establishments.

f) Sports Venues / Facilities: Stadiums, Sports Centres, Multipurpose halls, Swimming pools.