World Housing Encyclopedia

A Resource on Construction in Earthquake Regions

an initiative of
Earthquake Engineering Research Institue (EERI) and
International Association for Earthquake Engineering (IAEE)

HOUSING REPORT

Yurta

Report#	35
Last Updated	
Country	Kyrgyzstan
Author(s)	Ulugbek T. Begaliev , Svetlana Uranova,
Reviewers	Marjorie Greene,

Important

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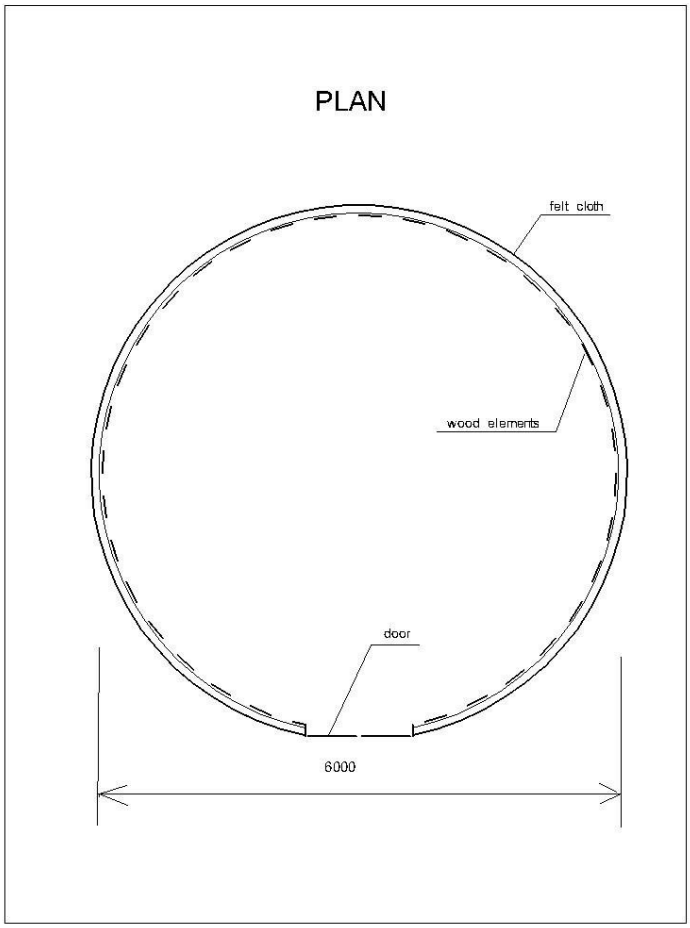
General Information

Building Type:	Yurta
Country:	Kyrgyzstan
Author(s):	Ulugbek T. Begaliev Svetlana Uranova
Last Updated:	
Regions Where Found:	Buildings of this construction type can be found in Kyrgyzstan, typically in the mountains. This type of housing construction is commonly found in rural areas.
Summary:	This type of building is the national traditional dwelling of the Kyrgyz people. It is light movable construction. The bearing structure of a yurta is a special wood frame, consisting of wood poles. The wood frame is covered by felt tension cloth.. The floors are traditionally covered with felt rugs (koshma). Yurtas can be easily unassembled and moved to new places. They are warm in winter and cool in the summer. The buildings have only one door and one opening in the roof. Yurtas are circular in plan. The diameter is usually 4m-6m. This type of building is used at the present time by shepherds, particularly during the summer, and for celebrations and funerals, and as temporary buildings during extreme situations in Kyrgyzstan. The yurta is a very light structure, has a symmetrical plan and has good seismic resistance.
Length of time practiced:	More than 200 years
Still Practiced:	Yes
In practice as of:	
Building Occupancy:	Single dwelling
Typical number of stories:	1
Terrain-Flat:	Never
Terrain-Sloped:	Typically
Comments:	

Features

Plan Shape	Curved, solid (e.g. circular, elliptical, ovoid)

Additional comments on plan shape	The typical building shape for a yurta is a circle.
Typical plan length (meters)	6
Typical plan width (meters)	6
Typical story height (meters)	4
Type of Structural System	Other
Additional comments on structural system	Lateral load-resisting system: Lateral Load-Resisting System consists of the very stable, evenly spaced wooden poles that form the frame. Gravity load-bearing system: Gravity Load-Bearing Structure consists of the frame formed by the wood poles.
Gravity load-bearing & lateral load-resisting systems	Wooden Space Frame: special frame of wooden poles, evenly spaced.
Typical wall densities in direction 1	4-5%
Typical wall densities in direction 2	4-5%
Additional comments on typical wall densities	Summary thickness of wall with wood pole is about 10cm. Wall density is on the order of 5%.
Wall Openings	House has no windows and has one door 1.9(h) m x 0.9m. There is also a circular opening in the roof.
Is it typical for buildings of this type to have common walls with adjacent buildings?	No
Modifications of buildings	Typically there are no modifications made to a yurta.
Type of Foundation	Other Foundation
Additional comments on foundation	No foundation.
Type of Floor System	Other floor system
Additional comments on floor system	
Type of Roof System	Roof system, other
Additional comments on roof system	Timber: Wooden pole
Additional comments section 2	Typical separation distance between buildings: minimum 10 meters as a rule



Plan of a Typical Building

Building Materials and Construction Process

Description of Building Materials

Structural Element	Building Material (s)	Comment (s)
Wall/Frame	Wall: felt cloth Frame: wood pole	
Foundations		
Floors		
Roof		Characteristic Strength: Mix Proportion/Dimensions:
Other		Characteristic Strength: Mix Proportion/Dimensions:

Design Process

Who is involved with the design process?	None of the above

Roles of those involved in the design process	There is no special expertise associated with this building type.
Expertise of those involved in the design process	

Construction Process

Who typically builds this construction type?	Owner
Roles of those involved in the building process	Usually shepherds live in yurtas. They assemble the yurtas themselves. It can also be used as a temporary building by any person. This building type is erected without engineers and architects.
Expertise of those involved in building process	The yurta is erected by its inhabitants/owners without any special building expertise or knowledge of building techniques.
Construction process and phasing	This building is typically constructed incrementally and isn't designed for its final constructed size.
Construction issues	

Building Codes and Standards

Is this construction type address by codes/standards?	2
Applicable codes or standards	Yurtas were used before introduction of building codes
Process for building code enforcement	

Building Permits and Development Control Rules

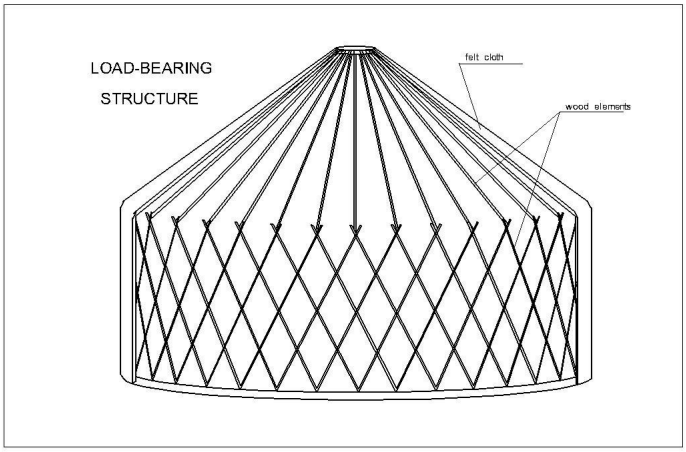
Are building permits required?	No
Is this typically informal construction?	Yes
Is this construction typically authorized as per development control rules?	No
Additional comments on building permits and development control rules	

Building Maintenance and Condition

Typical problems associated with this type of construction	It is necessary to have experience assembling wood pole bearing system.
Who typically maintains buildings of this type?	Owner(s)
Additional comments on maintenance and building condition	

Construction Economics

Unit construction cost	About 50-70$/m2.
Labor requirements	One day for 4 people.
Additional comments section 3	



An Illustration of Key Seismic Features and/or Deficiencies

Socio-Economic Issues

Patterns of occupancy	Yurta is a dwelling unit for one family.
Number of inhabitants in a typical building of this construction type during the day	5-10
Number of inhabitants in a typical building of this construction type during the evening/night	5-10

Additional comments on number of inhabitants	Less than 5, 5-10 day/night time inhabitants.
Economic level of inhabitants	Low-income class (poor)
Additional comments on economic level of inhabitants	80% poor, 20% middle class
Typical Source of Financing	Owner financedPersonal savings
Additional comments on financing	
Type of Ownership	Own outright
Additional comments on ownership	
Is earthquake insurance for this construction type typically available?	No
What does earthquake insurance typically cover/cost	
Are premium discounts or higher coverages available for seismically strengthened buildings or new buildings built to incorporate seismically resistant features?	No
Additional comments on premium discounts	
Additional comments section 4	

Earthquakes

Past Earthquakes in the country which affected buildings of this type

Year	Earthquake Epicenter
1992	Suusamir
1986	Kairakum

Past Earthquakes

Damage patterns observed in past earthquakes for this construction type	During the indicated earthquakes and many others, yurtas had no damages.
Additional comments on earthquake damage patterns	Yurtas have not been seriously damaged in earthquakes.

Structural and Architectural Features for Seismic Resistance

The main reference publication used in developing the statements used in this table is FEMA 310 “Handbook for the Seismic Evaluation of Buildings-A Pre-standard”, Federal Emergency Management Agency, Washington, D.C., 1998.

The total width of door and window openings in a wall is: For brick masonry construction in cement mortar : less than ½ of the distance between the adjacent cross walls; For adobe masonry, stone masonry and brick masonry in mud mortar: less than 1/3 of the distance between the adjacent cross walls; For precast concrete wall structures: less than 3/4 of the length of a perimeter wall.

Structural/Architectural Feature	Statement	Seismic Resistance
Lateral load path	The structure contains a complete load path for seismic force effects from any horizontal direction that serves to transfer inertial forces from the building to the foundation.	TRUE
Building Configuration-Vertical	The building is regular with regards to the elevation. (Specify in 5.4.1)	TRUE
Building Configuration-Horizontal	The building is regular with regards to the plan. (Specify in 5.4.2)	TRUE
Roof Construction	The roof diaphragm is considered to be rigid and it is expected that the roof structure will maintain its integrity, i.e. shape and form, during an earthquake of intensity expected in this area.	TRUE
Floor Construction	The floor diaphragm(s) are considered to be rigid and it is expected that the floor structure(s) will maintain its integrity during an earthquake of intensity	FALSE

	expected in this area.	
Foundation Performance	There is no evidence of excessive foundation movement (e.g. settlement) that would affect the integrity or performance of the structure in an earthquake.	FALSE
Wall and Frame Structures-Redundancy	The number of lines of walls or frames in each principal direction is greater than or equal to 2.	FALSE
Wall Proportions	Height-to-thickness ratio of the shear walls at each floor level is: Less than 25 (concrete walls); Less than 30 (reinforced masonry walls); Less than 13 (unreinforced masonry walls);	FALSE
Foundation-Wall Connection	Vertical load-bearing elements (columns, walls) are attached to the foundations; concrete columns and walls are doweled into the foundation.	TRUE
Wall-Roof Connections	Exterior walls are anchored for out-of-plane seismic effects at each diaphragm level with metal anchors or straps.	TRUE
Wall Openings		TRUE
Quality of Building Materials	Quality of building materials is considered to be adequate per the requirements of national codes and standards (an estimate).	TRUE
Quality of Workmanship	Quality of workmanship (based on visual inspection of a few typical buildings) is considered to be good (per local construction standards).	TRUE
Maintenance	Buildings of this type are generally well maintained and there are no visible	FALSE

	signs of deterioration of building elements (concrete, steel, timber).

Building Irregularities

Additional comments on structural and architectural features for seismic resistance	
Vertical irregularities typically found in this construction type	No irregularities
Horizontal irregularities typically found in this construction type	No irregularities
Seismic deficiency in walls	
Earthquake-resilient features in walls	Light weight bearing structures
Seismic deficiency in frames	
Earthquake-resilient features in frame	
Seismic deficiency in roof and floors	
Earthquake resilient features in roof and floors	
Seismic deficiency in foundation	
Earthquake-resilient features in foundation	

Seismic Vulnerability Rating

For information about how seismic vulnerability ratings were selected see the Seismic Vulnerability Guidelines

	High vulnerability		**Medium vulnerability**		**Low vulnerability**	
	A	B	C	D	E	F
Seismic vulnerability class					|-	o

Retrofit Information

Description of Seismic Strengthening Provisions

Structural Deficiency	Seismic Strengthening

Additional comments on seismic strengthening provisions	
Has seismic strengthening described in the above table been performed?	N/A
Was the work done as a mitigation effort on an undamaged building or as a repair following earthquake damages?	N/A
Was the construction inspected in the same manner as new construction?	N/A
Who performed the construction: a contractor or owner/user? Was an architect or engineer involved?	N/A
What has been the performance of retrofitted buildings of this type in subsequent earthquakes?	N/A
Additional comments section 6	

References

Seismic Hazard and Buildings Vulnerability in Post-Soviet Central Asia Republics. Nato Series.Netherland.

Buildings and Constructions Desing in Seismic Regions. Handbook.Bishkek.1996.

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