Załącznik nr 1/1
do Zarządzenia Rektora PG nr 5/2015 z 10 lutego 2015 r.

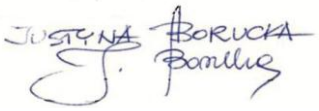
POLITECHNIKA GDAŃSKA
WYDZIAŁ ARCHITEKTURY

Imię i nazwisko autora rozprawy: **Najmeh Hassas**
Dyscyplina naukowa:**Architektura i urbanistyka**

ROZPRAWA DOKTORSKA

Tytuł rozprawy w języku polskim:**Typologia ianaliza porównawcza „czarnych namiotów" budowanych w tradycji plemion irańskich**

Tytuł rozprawy w języku angielskim: **Typology and comparative analysis of black tents built in tradition of iranian tribes**

Promotor	Promotor pomocniczy
 *podpis*	 *podpis*
Dr hab. inż. arch. Teresa Bardzińska-Bonenberg	Drinż. arch. Justyna Borucka

Gdańsk, rok 2021

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

The author of the PhD dissertation: **Najmeh Hassas**
Scientific discipline:**Architecture and Urban Planning**

DOCTORAL DISSERTATION

Title of PhD dissertation: **Typology andcomparative analysis of black tents built in tradition of iranian tribes**

Title of PhD dissertation (in Polish): **Typologia i analiza porównawcza „czarnych namiotów" budowanych w tradycji plemion irańskich**

Supervisor	Auxiliary supervisor
signature	*signature*
Dr hab. inż. arch. Teresa Bardzińska-Bonenberg	Drinż. arch. Justyna Borucka

Gdańsk, year 2021

POLITECHNIKA GDAŃSKA
WYDZIAŁ ARCHITEKTURY

OŚWIADCZENIE

Autor rozprawy doktorskiej: **Najmeh Hassas**

Ja, niżej podpisany(a), wyrażam zgodę~~/nie wyrażam zgody*~~ na bezpłatne korzystanie z mojej rozprawy doktorskiej zatytułowanej: **Typology and comparative analysis of black tents built in tradition of iranian tribus (Typologia i analiza porównawcza „czarnych namiotów" budowanych w tradycji plemion irańskich)**
do celów naukowych lub dydaktycznych.[1]

Gdańsk, dnia29.04.2021 .....
podpis doktoranta

Świadomy(a) odpowiedzialności karnej z tytułu naruszenia przepisów ustawy z dnia 4 lutego 1994 r. o prawie autorskim i prawach pokrewnych (Dz. U. z 2006 r., nr 90, poz. 631) i konsekwencji dyscyplinarnych określonych w ustawie Prawo o szkolnictwie wyższym (Dz. U. z 2012 r., poz. 572 z późn. zm.),[2] a także odpowiedzialności cywilno-prawnej oświadczam, że przedkładana rozprawa doktorska została napisana przeze mnie samodzielnie.

Oświadczam, że treść rozprawy opracowana została na podstawie wyników badań prowadzonych pod kierunkiem i w ścisłej współpracy z promotorem dr hab. inż. arch. Teresą Bardzińska-Bonenberg, promotorem pomocniczym dr inż. arch. Justyną Borucką.

Niniejsza rozprawa doktorska nie była wcześniej podstawą żadnej innej urzędowej procedury związanej z nadaniem stopnia doktora.

Wszystkie informacje umieszczone w ww. rozprawie uzyskane ze źródeł pisanych i elektronicznych, zostały udokumentowane w wykazie literatury odpowiednimi odnośnikami zgodnie z art. 34 ustawy o prawie autorskim i prawach pokrewnych.

Potwierdzam zgodność niniejszej wersji pracy doktorskiej z załączoną wersją elektroniczną.

Gdańsk, dnia.29.04.2021 .....
podpis doktoranta

Ja, niżej podpisany(a), wyrażam zgodę/~~nie wyrażam zgody~~* na umieszczenie ww. rozprawy doktorskiej w wersji elektronicznej w otwartym, cyfrowym repozytorium instytucjonalnym Politechniki Gdańskiej, Pomorskiej Bibliotece Cyfrowej oraz poddawania jej procesom weryfikacji i ochrony przed przywłaszczaniem jej autorstwa.

Gdańsk, dnia 29.04.2021 . .....
podpis doktoranta

*) niepotrzebne skreślić

[1] Zarządzenie Rektora Politechniki Gdańskiej nr 34/2009 z 9 listopada 2009 r., załącznik nr 8 do instrukcji archiwalnej PG.

[2] Ustawa z dnia 27 lipca 2005 r. Prawo o szkolnictwie wyższym: Rozdział 7 Odpowiedzialność dyscyplinarna doktorantów, Art. 226.

POLITECHNIKA GDAŃSKA
WYDZIAŁ ARCHITEKTURY

STATEMENT

The author of the PhD dissertation: **Najmeh Hassas**

I, the undersigned, agreethat my PhD dissertation titled: **Typology and comparative analysis of Black Tents in the Tradition of Iranian Tribes**
may be used for scientific or didactic purposes.[1]

Gdańsk,29.04.2021. .....
signature of the PhD student

Aware of criminal liability for violations of the Act of 4th February 1994 on Copyright and Related Rights (Journal of Laws 2006, No. 90, item 631) and disciplinary actions set out in the Law on Higher Education (Journal of Laws 2012, item 572 with later amendments),[2] as well as civil liability, I declare, that the submitted PhD dissertation is my own work.

I declare, that the submitted PhD dissertation is my own work performed under and in cooperation with the supervision of D. Sc Ph. D. Arch. Teresa Bardzińska-Bonenberg, the second supervision ofPh. D. Arch. Justyna Borucka.

This submitted PhD dissertation has never before been the basis of an official procedure associated with the awarding of a PhD degree.

All the information contained in the above thesis which is derived from written and electronic sources is documented in a list of relevant literature in accordance with art. 34 of the Copyright and Related Rights Act.

I confirm that this PhD dissertation is identical to the attached electronic version.

Gdańsk, 29.04.2021. .....
signature of the PhD student

I, the undersigned, agreeto include an electronic version of the above PhD dissertationin the open, institutional, digital repository of Gdańsk University of Technology, Pomeranian Digital Library,and for it to be submitted to the processes of verification and protection against misappropriation of authorship.

Gdańsk, 29.04.2021. .....
signature of the PhD student

[1] Decree of Rector of Gdansk University of Technology No. 34/2009 of 9th November 2009, TUG archive instruction addendum No. 8.

[2] Act of 27th July 2005,Law on Higher Education:Chapter 7, Criminal responsibility of PhD students, Article 226.

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

OPIS ROZPRAWY DOKTORSKIEJ

Autor rozprawy doktorskiej: **Najmeh Hassas**

Tytuł rozprawy doktorskiej w języku polskim: Typologia i analiza porównawcza „czarnych namiotów" budowanych w tradycji plemion irańskich

Tytuł rozprawy w języku angielskim: Typology and comparative analysis of black tents built in tradition of iranian tribus

Język rozprawy doktorskiej: angielski

Promotor rozprawy doktorskiej: Dr hab. inż. arch. Teresa Bardzińska-Bonenberg

Drugi promotor rozprawy doktorskiej*: -

Promotor pomocniczy rozprawy doktorskiej*: Dr inż. arch. Justyna Borucka

Kopromotor rozprawy doktorskiej*:-

Data obrony: …….

Słowa kluczowe rozprawy doktorskiej w języku polski: Architektura Wernakularna; Czarny Namiot; Nomadzi Irańscy; Szkieletowa Konstrukcja Drewniana; Badania Laboratoryjne Tkaniny Namiotu; Cyfrowy Model Namiotu; Analiza Stanów Granicznych

Słowa kluczowe rozprawy doktorskiej w języku angielskim: Vernacular Architecture; Black Tent; Iranian Nomads; Timber Frame Structure; Tent Fabric Laboratory Analysis; Tent Digital Model; Borderline States Analysis

Streszczenie rozprawy w języku polskim:

Wielka przestrzeń Wschodniej i Centralnej Azji, Bliskiego Wschodu i Północnej Afryki była świadkiem wielu form współżycia ludów, a wśród nich przemieszczały się plemiona nomadów. Wędrówka jest podstawą życia takich grup, które istniały od początków ludzkości.
Wiele badań wskazuje na geograficzne, polityczne i socjoekonomiczne czynniki, jako powód ukształtowania się i rozwoju tego sposobu życia na Wyżynie Irańskiej. Wśród nich czynnik geograficzny wywarł decydujący wpływ na fakt, że hodowla stała się głównym zajęciem ludzi. W Iranie żyje do dziś wiele plemion nomadów. Podczas wędrówki zabierają ze sobą domy, przenosząc je z miejsc pobytu letniego do zimowego i z powrotem. Domy zostały dostosowane do ich trybu życia i warunków geograficznych. Stąd można wnioskować, że ta przenośna i poręczna konstrukcja była używana przez nomadów od najdawniejszych czasów. W badaniu zwrócono uwagę na obyczaje i sposób życia nomadów, ale głównym przedmiotem zainteresowania były właśnie ich domy.

Iran leży na Środkowym Wschodzie i jego wielki obszar charakteryzuje się bardzo zróżnicowaną rzeźbą terenu. Różnorodność środowiska naturalnego spowodowała, że plemiona dostosowując się przez pokolenia do różnych warunków środowiska naturalnego zróżnicowały sposoby budowy namiotów i urządzania ich. Plemiona, które utrzymują się z hodowli bydła podążają ze stadami na tereny gdzie można znaleźć paszę. Mają mało przedmiotów, którymi się posługują. Namioty, w których żyją są urządzone prosto, a każdy przedmiot, który tam znajduje się pełni zazwyczaj kilka funkcji.

Same namioty, nazywane Czarnymi Namiotami (*Black Tents*) wykonane są z tkaniny z długich czarnych włosów irańskich kóz. Konstrukcje namiotów były udoskonalane przez wieki, a w związku z tym że występują w różnych częściach Iranu są one bardzo różnorodne. Reprezentują osiągnięcia rzemiosła i współtworzą kulturowe dziedzictwo Iranu. Plemiona nomadów rozwinęły także własny system wierzeń i obrzędów z nich wynikających. Stroje, wyroby, ozdoby tworzą istotny i zróżnicowany element kultury perskiej.

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

W badaniach podjęty został temat konstrukcji Czarnych Namiotów i sposobu kształtowania przestrzeni, w której toczy się życie rodziny. Badania dotyczyły form architektonicznych namiotów, ich konstrukcji i materiałów, z których są wznoszone, a także wyposażenia wnętrz i przedmiotów, które decydują o jego charakterze.
Ze względu na obszar kraju i rozproszenie plemion do badań wybranych zostało siedem z nich, wędrujących w różnych warunkach topograficznych i klimatycznych. Warunki te zostały szczegółowo opracowane i pozwoliły na określenie ekstremalnych i średnich zjawisk pogodowych dla letnich i zimowych miejsc pobytu siedmiu, plemion. Dla nich też przeprowadzone zostały porównania konstrukcji namiotów.

Metoda jaką zastosowano w badaniu obejmowała analizę opisową i przedstawienie graficzne wyników badań. Kwerenda prowadzona była w bibliotekach, archiwach i instytucjach, dane pozyskiwane były też z oficjalnych stron internetowych. Autorka przeprowadziła również inwentaryzacje rysunkowe i fotograficzne namiotów i codziennego życia nomadów. Uczestniczyła również w migracji (obserwacja uczestnicząca) prowadząc wywiady z przedstawicielami społeczności nomadów. Badania laboratoryjne kolejnej fazy pracy zostały udokumentowane wydrukami i przedstawieniami zestawów urządzeń wykorzystanych w badaniach. Dalsza analiza prowadzona była z zastosowaniem zaawansowanych programów komputerowych, takiego jak 3DMax, ABAQUS i innych profesjonalnych, narzędzi cyfrowych mających zastosowanie w budownictwie, a pozwalających na uzyskanie porównywalnych wyników. Rezultaty badań i podsumowania poszczególnych ich faz przedstawione zostały w formie map, wykresów i tabel.

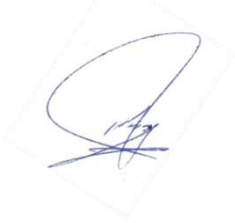
Życie nomadów było już przedmiotem wielu badań, jednak głównie ze społecznego punktu widzenia. Badania przeprowadzone przez autorkę po raz pierwszy dotyczą fizyczno-mechanicznej strony rozwiązań jakie stosuje się w konstrukcji namiotów.

W wyniku badań makroskopowych okazało się, że tkanina, którą są okrywane konstrukcje (*chador*) jest taka sama dla wszystkich plemion. Kobiety, które ją tkają również wznoszą i demontują namioty przed i po podróży, toteż mają wpływ na ich konstrukcję. Analiza wymiarów i form omawianych siedmiu typów namiotów pochodzących z różnych części kraju wykazała duże zróżnicowania, świadczące o kreatywności i inżynierskim myśleniu. Kolejnym etapem było sprawdzenie na ile stabilność każdego z namiotów jest dostosowana do sytuacji klimatycznej, w której jest używany. W tym celu zostały sporządzone modele w programie ABACUS. Ich reakcje na obciążenie wiatrem i deszczem zostały zbadane.

Potwierdzone zostało przypuszczenie, że namioty są dostosowane ściśle do warunków w jakich są używane. Ich dywersyfikacja jest wynikiem doświadczeń wielu pokoleń nomadów: obserwacji szlaków, które przemierzali i materiałów, z których mogli korzystać. Badania modeli namiotów pokrytych tkaniną ręcznie wykonaną z włosów kóz wykazały jej większą przydatność dla wzmocnienia konstrukcji namiotu i ochrony jego wnętrza niż współczesne tkaniny używane w podobnym celu.

„Czarny Namiot" jest jednym z najmniej dotąd poznanych elementów perskiej kultury. Ostatnie dekady nie były korzystne dla społeczności nomadów, a bez odpowiedniego wsparcia i ciągłych badań kultura ta może zginąć. Pierwszym etapem powinno stać się zrozumienie unikalnej technologii i niepowtarzalnej wartości, którą stworzyły te plemiona.

Właściwym krokiem, który miał już miejsce, stało się zarejestrowanie, w 2012 roku, za sprawą autorki, „Czarnego Namiotu" plemienia Qashqai z prowincji Fars jako elementu niematerialnego dorobku kultury Iranu. Należy mieć nadzieję, że niniejsza praca przyczyni się do kolejnych etapów zachowania tego dziedzictwa.



GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

Streszczenie rozprawy w języku angielskim:

The great expanse of East and Central Asia, the Middle East and North Africa witnessed many forms of coexistence of peoples, including nomadic tribes. Being on a trail is the basis of the life of such groups that have existed since the beginning of mankind. Many studies point to geographic, political and socio-economic factors as the reason for the formation and development of this way of life in the Iranian Highlands. Among them, the geographic factor had a decisive influence on the fact that breeding became the main occupation of people. Many nomadic tribes still live in Iran today. During their journey, they take their houses with them, moving them from summer to winter stay and back. The houses were adapted to their lifestyle and geographic conditions. Hence it can be concluded that this portable and flexible structure has been used by nomads from the earliest times. This study focused on the habits and way of life of nomads, but their homes were of the main interest.

Iran is located in the Middle East and its large area is characterized by a very varied topography. Various natural environments meant that the tribes, adapting to the conditions for generations, differentiated the ways of building tents and arranging them. Tribes that make a living by raising cattle go with herds to areas where fodder can be found. They have few items to handle because of the necessity to move. The tents are simply furnished, and each item that is there usually performs several functions. The tents themselves, called Black Tents, are made of cloth woven from long black goat hair. Tent constructions have been refined over the centuries, and due to the fact that they appear in different parts of Iran, they are very diverse. They represent high craftsmanship and contribute to the cultural heritage of Iran.

The tribes of nomads also developed their own system of beliefs and rituals resulting from them. Costumes, products and ornaments constitute an important and varied element of Persian culture. The research explored the construction of the Black Tents and the way of shaping the space in which family life takes place. It concerned the architectural forms of tents, structures and materials from which they are erected, as well as interior furnishings and objects that determine their character. Due to the area of the country and the dispersion of the tribes, seven of them were selected, wandering in different topographic and climatic conditions. These conditions were analysed in detail and made it possible to determine the extreme and average weather phenomena for the summer and winter whereabouts of the seven tribes. Comparisons were made between their tents.

The methods used in the research include descriptive analysis and graphical presentation of the test results. The inquiry was conducted in libraries, archives and institutions and using official websites. The author also conducted drawing and photographic inventories of tents and everyday life of nomads. She participated in the migration (participant observation) and conducted interviews with representatives of the nomadic community. Laboratory tests of the next phase of work have been documented with printouts and presentations of the sets of devices used in the research. Further analysis was carried out using advanced software computer programmes, such as 3DMax, ABAQUS and other professional civil engineering digital tools allowing to obtain comparable results. The research results and summaries of their individual phases are presented in the form of maps, charts and tables.

The life of nomads has already been the subject of many research, however, mainly from a social point of view. The research conducted by the author for the first time concerns the physical and mechanical side of solutions used in the tents.

As a result of macroscopic studies, it turned out that the fabric with which the structures are covered (Chador), which is woven by women, is the same for all tribes. Women also erect and dismantle tents before and after the journey and so have an influence on their construction. The analysis of the dimensions and forms of the discussed seven types of tents from different parts of the country showed large differences, which is evidence of creativity and engineering thinking. The next step of the research was to check to what extent the stability of each tent is adjusted to the climatic situation in which it is used. For this purpose, models were created in the ABACUS program. Their responses to wind and rain loads have been studied.

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

It has been confirmed that the tents are strictly adapted to the conditions in which they are used. Their diversification is the result of the experience of many generations of nomads: observing the routes they traveled and the materials they could use. Tests of tent models covered with hand-made goat hair fabric showed that it is more useful for strengthening the structure of the tent and protecting its interior than fabrics used today for a similar purpose.

The Black Tent is one of the least known elements of Persian culture. Recent decades have not been favorable to the nomadic community, and without support and continuous research this culture may perish. The first step should be to understand the unique technology and culture that these tribes have created.

The right step, that was promoted by author and which has already taken place, was to register the Black Tent of Qashqai tribe from the Fars province in 2012 as an intangible cultural heritage of Iran. There is a hope, that this thesis can be useful for further steps in preservation of this heritage.

Streszczenie rozprawy w języku, w którym została napisana**:-

Słowa kluczowe rozprawy doktorskiej w języku, w którym została napisana**: -

*) niepotrzebne skreślić.

**) dotyczy rozpraw doktorskich napisanych w innych językach, niż polski lub angielski.

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

DESCRIPTION OF DOCTORAL DISSERTATION

The Author of the PhD dissertation: **Najmeh Hassas**
Title of PhD dissertation: Typology and comparative analysis of black tents built in tradition of iranian tribus

Title of PhD dissertation in Polish: Typologia i analiza porównawcza „czarnych namiotów" budowanych w tradycji plemion irańskich

Language of PhD dissertation: English

Supervision: Dr hab. inż. arch. Teresa Bardzińska-Bonenberg

Second supervision*: -

Auxiliary supervision*: Dr inż. arch. Justyna Borucka

Cosupervision*: -

Date of doctoral defense: ……

Keywordsof PhD dissertation in Polish: Architektura Wernakularna; Czarny Namiot; Nomadzi Irańscy; Szkieletowa Konstrukcja Drewniana; Badania Laboratoryjne Tkaniny Namiotu; Cyfrowy Model Namiotu; Analiza Stanów Granicznych

Keywords of PhD dissertation in English: Vernacular Architecture; Black Tent; Iranian Nomads; Timber Frame Structure; Tent Fabric Laboratory Analysis; Tent Digital Model; Borderline States Analysis

Summary of PhD dissertation in Polish:

Wielka przestrzeń Wschodniej i Centralnej Azji, Bliskiego Wschodu i Północnej Afryki była świadkiem wielu form współżycia ludów, a wśród nich przemieszczały się plemiona nomadów. Wędrówka jest podstawą życia takich grup, które istniały od początków ludzkości.
Wiele badań wskazuje na geograficzne, polityczne i socjoekonomiczne czynniki, jako powód ukształtowania się i rozwoju tego sposobu życia na WyżynieIrańskiej. Wśród nich czynnik geograficzny wywarł decydujący wpływ na fakt, że hodowla stała się głównym zajęciem ludzi. W Iranie żyje do dziś wiele plemion nomadów. Podczas wędrówki zabierające sobą domy, przenosząc je z miejsc pobytu letniego do zimowego i z powrotem. Domy zostały dostosowane do ich trybu życia i warunków geograficznych. Stąd można wnioskować, że ta przenośna i poręczna konstrukcja była używana przez nomadów od najdawniejszych czasów. W badaniu zwrócono uwagę na obyczaje i sposób życia nomadów, ale głównym przedmiotem zainteresowania były właśnie ich domy.

Iran leży na Środkowym Wschodzie i jego wielki obszar charakteryzuje się bardzo zróżnicowaną rzeźbą terenu. Różnorodność środowiska naturalnego spowodowała, że plemiona dostosowując się przez pokolenia do różnych warunków środowiska naturalnego zróżnicowały sposoby budowy namiotów i urządzania ich. Plemiona, które utrzymują się z hodowli bydła podążają ze stadami na tereny gdzie można znaleźć paszę. Mają mało przedmiotów, którymi się posługują. Namioty, w których żyją są urządzone prosto, a każdy przedmiot, który tam znajduje się pełni zazwyczaj kilka funkcji.

Same namioty, nazywane Czarnymi Namiotami (*Black Tents*) wykonane są z tkaniny z długich czarnych włosów irańskich kóz. Konstrukcje namiotów były udoskonalane przez wieki, a w związku z tym że występują w różnych częściach Iranu są one bardzo różnorodne. Reprezentują osiągnięcia rzemiosła i współtworzą kulturowe dziedzictwo Iranu. Plemiona nomadów rozwinęły także własny system wierzeń i obrzędów z nich wynikających. Stroje, wyroby, ozdoby tworzą istotny i zróżnicowany element kultury perskiej.

W badaniach podjęty został temat konstrukcji Czarnych Namiotów i sposobu kształtowania przestrzeni, w której toczy się życie rodziny. Badania dotyczyły form

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

architektonicznych namiotów, ich konstrukcji i materiałów, z których są wznoszone, a także wyposażenia wnętrz i przedmiotów, które decydują o jego charakterze.
Ze względu na obszar kraju i rozproszenie plemion do badań wybranych zostało siedem z nich, wędrujących w różnych warunkach topograficznych i klimatycznych. Warunki te zostały szczegółowo opracowane i pozwoliły na określenie ekstremalnych i średnich zjawisk pogodowych dla letnich i zimowych miejsc pobytu siedmiu, plemion. Dla nich też przeprowadzone zostały porównania konstrukcji namiotów.

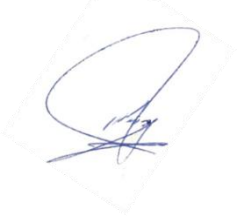
Metoda jaką zastosowano w badaniu obejmowała analizę opisową i przedstawienie graficzne wyników badań. Kwerenda prowadzona była w bibliotekach, archiwach i instytucjach, dane pozyskiwane były też z oficjalnych stron internetowych. Autorka przeprowadziła również inwentaryzacje rysunkowe i fotograficzne namiotów i codziennego życia nomadów. Uczestniczyła również w migracji (obserwacja uczestnicząca) prowadząc wywiady z przedstawicielami społeczności nomadów. Badania laboratoryjne kolejnej fazy pracy zostały udokumentowane wydrukami i przedstawieniami zestawów urządzeń wykorzystanych w badaniach. Dalsza analiza prowadzona była z zastosowaniem zaawansowanych programów komputerowych, takiego jak 3DMax, ABAQUS i innych profesjonalnych, narzędzi cyfrowych mających zastosowanie w budownictwie, a pozwalających na uzyskanie porównywalnych wyników. Rezultaty badań i podsumowania poszczególnych ich faz przedstawione zostały w formie map, wykresów i tabel.

Życie nomadów było już przedmiotem wielu badań, jednak głównie ze społecznego punktu widzenia. Badania przeprowadzone przez autorkę po raz pierwszy dotyczą fizyczno-mechanicznej strony rozwiązań jakie stosuje się w konstrukcji namiotów.
W wyniku badań makroskopowych okazało się, że tkanina, którą są okrywane konstrukcje (*chador*) jest taka sama dla wszystkich plemion. Kobiety, które ją tkają również wznoszą i demontują namioty przed i po podróży, toteż mają wpływ na ich konstrukcję. Analiza wymiarów i form omawianych siedmiu typów namiotów pochodzących z różnych części kraju wykazała duże zróżnicowania, świadczące o kreatywności i inżynierskim myśleniu. Kolejnym etapem było sprawdzenie na ile stabilność każdego z namiotów jest dostosowana do sytuacji klimatycznej, w której jest używany. W tym celu zostały sporządzone modele w programie ABACUS. Ich reakcje na obciążenie wiatrem i deszczem zostały zbadane.

Potwierdzone zostało przypuszczenie, że namioty są dostosowane ściśle do warunków w jakich są używane. Ich dywersyfikacja jest wynikiem doświadczeń wielu pokoleń nomadów: obserwacji szlaków, które przemierzali i materiałów, z których mogli korzystać. Badania modeli namiotów pokrytych tkaniną ręcznie wykonaną z włosów kóz wykazały jej większą przydatność dla wzmocnienia konstrukcji namiotu i ochrony jego wnętrza niż współczesne tkaniny używane w podobnym celu.

„Czarny Namiot" jest jednym z najmniej dotąd poznanych elementów perskiej kultury. Ostatnie dekady nie były korzystne dla społeczności nomadów, a bez odpowiedniego wsparcia i ciągłych badań kultura ta może zginąć. Pierwszym etapem powinno stać się zrozumienie unikalnej technologii i niepowtarzalnej wartości, którą stworzyły te plemiona.

Właściwym krokiem, który miał już miejsce, stało się zarejestrowanie, w 2012 roku, za sprawą autorki, „Czarnego Namiotu" plemienia Qashqai z prowincji Fars jako elementu niematerialnego dorobku kultury Iranu. Należy mieć nadzieję, że niniejsza praca przyczyni się do kolejnych etapów zachowania tego dziedzictwa.



GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

Summary of PhD dissertation in English:

The great expanse of East and Central Asia, the Middle East and North Africa witnessed many forms of coexistence of peoples, including nomadic tribes. Being on a trail is the basis of the life of such groups that have existed since the beginning of mankind. Many studies point to geographic, political and socio-economic factors as the reason for the formation and development of this way of life in the Iranian Highlands. Among them, the geographic factor had a decisive influence on the fact that breeding became the main occupation of people. Many nomadic tribes still live in Iran today. During their journey, they take their houses with them, moving them from summer to winter stay and back. The houses were adapted to their lifestyle and geographic conditions. Hence it can be concluded that this portable and flexible structure has been used by nomads from the earliest times. This study focused on the habits and way of life of nomads, but their homes were of the main interest.

Iran is located in the Middle East and its large area is characterized by a very varied topography. Various natural environments meant that the tribes, adapting to the conditions for generations, differentiated the ways of building tents and arranging them. Tribes that make a living by raising cattle go with herds to areas where fodder can be found. They have few items to handle because of the necessity to move. The tents are simply furnished, and each item that is there usually performs several functions. The tents themselves, called Black Tents, are made of cloth woven from long black goat hair. Tent constructions have been refined over the centuries, and due to the fact that they appear in different parts of Iran, they are very diverse. They represent high craftsmanship and contribute to the cultural heritage of Iran.

The tribes of nomads also developed their own system of beliefs and rituals resulting from them. Costumes, products and ornaments constitute an important and varied element of Persian culture. The research explored the construction of the Black Tents and the way of shaping the space in which family life takes place. It concerned the architectural forms of tents, structures and materials from which they are erected, as well as interior furnishings and objects that determine their character. Due to the area of the country and the dispersion of the tribes, seven of them were selected, wandering in different topographic and climatic conditions. These conditions were analysed in detail and made it possible to determine the extreme and average weather phenomena for the summer and winter whereabouts of the seven tribes. Comparisons were made between their tents.

The methods used in the research include descriptive analysis and graphical presentation of the test results. The inquiry was conducted in libraries, archives and institutions and using official websites. The author also conducted drawing and photographic inventories of tents and everyday life of nomads. She participated in the migration (participant observation) and conducted interviews with representatives of the nomadic community. Laboratory tests of the next phase of work have been documented with printouts and presentations of the sets of devices used in the research. Further analysis was carried out using advanced software computer programmes, such as 3DMax, ABAQUS and other professional civil engineering digital tools allowing to obtain comparable results. The research results and summaries of their individual phases are presented in the form of maps, charts and tables.

The life of nomads has already been the subject of many research, however, mainly from a social point of view. The research conducted by the author for the first time concerns the physical and mechanical side of solutions used in the tents.

As a result of macroscopic studies, it turned out that the fabric with which the structures are covered (Chador), which is woven by women, is the same for all tribes. Women also erect and dismantle tents before and after the journey and so have an influence on their construction. The analysis of the dimensions and forms of the discussed seven types of tents from different parts of the country showed large differences, which is evidence of creativity and engineering thinking. The next step of the research was to check to what extent the stability of each tent is adjusted to the climatic situation in which it is used. For this purpose, models were created in the ABACUS program. Their responses to wind and rain loads have been studied.

GDAŃSK UNIVERSITY OF TECHNOLOGY
FACULTY OF ARCHITECTURE

It has been confirmed that the tents are strictly adapted to the conditions in which they are used. Their diversification is the result of the experience of many generations of nomads: observing the routes they traveled and the materials they could use. Tests of tent models covered with hand-made goat hair fabric showed that it is more useful for strengthening the structure of the tent and protecting its interior than fabrics used today for a similar purpose.

The Black Tent is one of the least known elements of Persian culture. Recent decades have not been favorable to the nomadic community, and without support and continuous research this culture may perish. The first step should be to understand the unique technology and culture that these tribes have created.

The right step, that was promoted by author and which has already taken place, was to register the Black Tent of Qashqai tribe from the Fars province in 2012 as an intangible cultural heritage of Iran. There is a hope, that this thesis can be useful for further steps in preservation of this heritage.

Summary of PhD dissertation in language, in which it was written**: -

Keywords of PhD dissertation in language, in which it was written**:-

*)delete where appropriate.

**) applies to doctoral dissertations written in other languages, than Polish or English.

Table of contents

1 INTRODUCTION

1.1 Genesis of research

Research for the BA thesis concluded by the author few years ago was focused on winter Black Tent in Fars Province in Iran. This was a moment when deficiencies in sources concerning the Black Tent as an architectural, structural and functional achievement were noticed. In the doctorate Thesis, the theme of Iranian nomads' habitats is widened in the scope, field and time-line aspects of research.

Simple lives of nomad tribes are perceived as imprints of distant times. They are subjects of ethnographic, ethnologic, sociological and philological research. Nomads were, and still are on the move so there are no settlements left from the olden days nor today's permanent villages. Their migrations occur throughout spring and autumn, precise time depending on the region and weather. Architecture they create is limited to a structure of a tent – the Iranian nomadic tribe shelter – the Black Tent.

This Tent is functionally adapted to all needs of nomad community. It proved to be the best form for harsh uplands and highlands weather conditions as well as on Iran lowlands. To build such structure it demands experience, creativity and immense knowledge of materials and environment.

Nomadic life is adjusted to the surrounding nature and so are their communities, culture and craft. Iranian nomadic architecture, exemplified by the Black Tent, is the least recognized element of their culture. So far it has not received analysis of structures, which are diversified in different regions. This research aims at reducing this cognitive deficiency.

1.2 Specification of the aim of the research

The goal of the research is to analyse contemporary Black Tents in three, basic architectural aspects: function, construction and form. Foldable, flexible and vernacular Tent is much less simple than it seems at first. Therefore, the analysis will span between technical and social sciences and will be widened to theother fields.

Basis for the multitude of functions the Tent can carry is supplied by humanistic sciences. Forms of Tents built now in different regions of Iran differ for tribal-cultural reasons and this will constitute a part of research based on ethnology and sociology. Nevertheless, the main theme will be the analysis of the structure of Tents and their ability to withstand the weather conditions and regular actions they undergo: pulling down, packing for transport, unpacking, unfolding and putting up again. This process takes place twice a year.

The following particular fields of study will be included in the work:

- study of contemporary types of Black Tents (tribal nomadic tents) with reference to their structure in different parts of Iran
- identification of existing nomad trails
- typology of structure forms among Iranian Black Tents–and their ability to withstand particular weather conditions on the trail.
- classification of methods of construction and used materials

- analysis of contemporary nomadic home: social life, customs and the relationship between members of the families/tribes
- indigenous and vernacular nomadic technology knowledge: as the Black Tent fabrics are women product, research on passing over knowledge on details of the craft; the same concerns young men with reference to the tent construction.
- historical data in geographical, ethnic and cultural aspects
- recognition of perspectives of nomadic tribes' life in Iran
- guidelines for protection and conservation of the Black Tents

1.3 State of research

There are several extensive research works published on contemporary nomadic life. They examine social aspects like migration, policies concerning nomad groups, customs and culture of nomadic tribes and their crafts. There is also a number of publications dealing with the art of decoration of the tents and housewares. Publications do not deal with tent structures and analysis of the habitats in joined technical and functional aspects, nor the ways of constructing the Black Tents by the different nomad tribes. They include some basic information about the tents' materials and their shapes.
The following books were analyzed by the author before undertaking the research:

- Bacon, E. E. (1946). A preliminary attempt to determine the culture areas of Asia, Southwestern Journal of Anthropology, the book discusses anthropological issues in Asia especially among nomadic people.
- Baharvand, A. (1981). Nomadism in Iran. Ketab Publications. Tehran. Iran.
- Anthropological aspect of economy, ecology, family relation in tribes and social divisions in Iranian communities.
- Digard, P. (1990). Bakhtiari nomadism techniques. Razavi Publications. Mashhad, Iran.
- Research on Bakhtiari tribe which lives in the western part of Iran. Refers to anthropology, economy, ecology, family relation within the tribe and social levels between them.
- Feilberg, C. G. (1980). trans., Asghar Karimi, La tente noire contribution ethnographique a l'histoire culturelle des nomads. Published byKobenhavn. This book seems to be the best and first reference source on nomadic life style and typology of tents in the word. It contains only primary information about Iranian nomadic life and its details.
- Goldschmidt, W. (1965). Variation and Adaptability in culture: Symposium:Cultural diversity in Asian cultures with reference to nomadic Iranian people.
- Kiani, Manouchehr. (2006). Black tent. Kian Publishing. Shiraz. Iran. The book contains some information about migration, shelters, customs, politic and nomadic relation in different social tribe levels, particularly on Qashqai nomad tribe in Fars Province.
- Krader, L. (1956). Culture and environment in interior Asia, studies in human ecology, Social science monographs, No.3. pp. 115-138. Pan American Union. Although the article concerns relation between culture and nature human life in Asia, it focuses on relation between human in primary society.
- Moshiri, R. (1993). Nomad geography. Samt Publications. Tehran. Iran. Refrence book for locations of tribes and general geography of Iran; also on nomadic migrations.

- Soraya, M. (1969). Qashqai social structure, Islamic culture, XLIII: 2. No.2. 125-142. Social divisions within community of Qasghqai Tribe.
- Spooner, B. (1966). Iranian kinship and marriage. Journal of the British Institute of Persian Studies. Iran. Vol. IV, PP.51-60. Tribal customs, particularly wedding in different tribes. Stauffer, T. (1965). The Qashqai nomads, A contemporary appraisal, The Harvard Review, I, 3: 28-39. Overview of Qashqai tribe life style, their social relations and the other customs from past to contemporary.

Life of small nomad communities, which are different than the most of contemporary Iranians, are subject to artistic interpretations by photographers, film makers and writers. Some of the documents reflect reality and some create romantic and unreal image of lives of nomads. This descriptive material, while used in research must be thoroughly checked to avoid misleading threads.

Discussed books and articles listed in the Bibliography do not cover all the literature of the subject of Black Tents, but they form recognized core of research in this field. Some positions were published many years ago when research was carried in traditional techniques. Contemporary, computer aided structural analysis will help to recognize vernacular greatness of the Black Tents. It will add knowledge on adaptability of these structures to the weather conditions and other occurrences common in Iran, and to the way of life of contemporary Iranian nomads.

Recognition of the Black Tents structures as a technical achievement of the generations of nomads demands analysis of data such as climate, accessible materials and family structures. These vary among tribes. On such basis analysis of construction of the Tents adjusted to different climatic and social conditions can add information lacking in accessible literature.

This theme was not developed in literature and according to the information obtained on conferences and congresses held on the related topics, no such research is actually taking place.

1.4 Field of research and Thesis

Fig.1: Map of Iran indicating regions where analysis of nomad Black Tents is undertaken, source: Bakhtiari, S., 1984, p.38

Nomad tribes live now in most provinces of Iran. The chosen tribes (1-7) exemplify different cultures, languages, customs and methods of migration between their summer and winter places of residence. They vary in many ways: in some cases, their summer tents differ from the winter ones although they are built of the same elements.
These tribes have been also chosen for different climatic conditions, mountain ranges, deserts and lowlands they pass while wandering. Topography of their trails create another interesting topic. Some of them are marked on the enclosed maps.

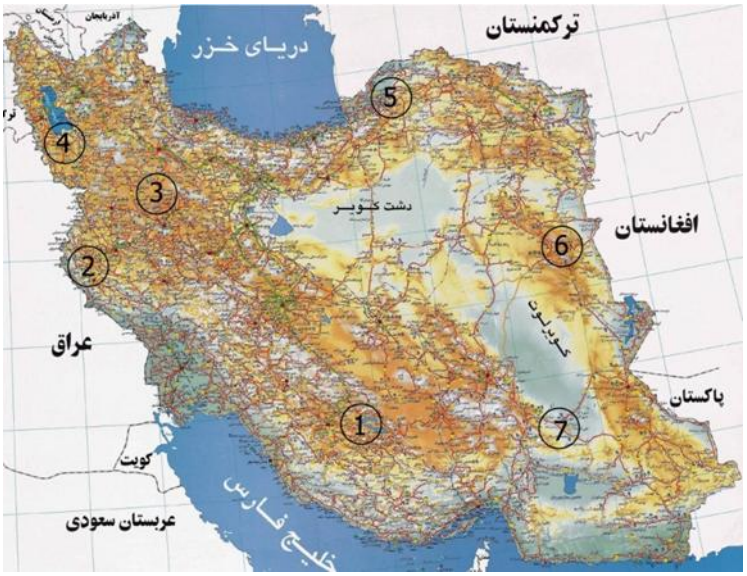


Fig.2: Map of Iran indicating different topographic situation of the regions where Iranian nomad tribes live, source: Bakhtiari, S, 1984, p.24

1. Qashqai Tribe in Fars Province
2. Arkovazi Tribe in Ilam Province
3. YaromTatli Tribe in Hamedan Province
4. Garapapakh Tribe in Azarbayjan Province
5. Kormanj Tribe in Golestan Province
6. Bahlooli Tribe in Sistan Province
7. Soleimani Tribe in Kerman Province

Initial research is aimed at assessing basic Black Tent structures in different regions and defining basic Tent models of these groups. Survey/inventory drawings are prepared for chosen examples of the Black Tents, showing the extremes in constructions. The examples will undergo detailed computer analysis by modeling their performance in different climatic occurrences. It is perceived that their constructions are exactly strong enough to resist local extreme conditions in these particular regions. The simulations will be carried in this aspect but it is impossible to predict the results at this stage of research.
In most provinces of Iran there are still nomad tribes making twice a year their trail to and from their summer and winter seats, in some cases up and down the slopes of the mountains. In the beginning of spring, depending on the weather, they start to migrate to their summer places and in end of summer they wander to their winter residence areas.

All the tribes have permanent places for their residences in winter and summer and they are the owners of these territories using all natural resources available there. One tribe is not allowed to use the other tribe territory.

As the trails of the tribes differ depending on the topography of their land, some of them cover big differences in levels going up and down twice a year. Tribes living in less topographically diversified regions cover longer but more level distances. In literature it is even known as vertical and horizontal movement of the tribes (Moshiri, R., 1993, p. 15). Qashqai tribe in Fars Province (Tribe No.1. on the Map), has typical vertical trail between winter and summer places (Hassas, N., 2012, p.14).

The same tribe was a subject of initial research by the author while she was preparing her BA dissertation in Apadana University under supervision of Dr. Amin Mahmoudzade. The research was focused on winter Tent of Qashqai tribe in Fars Province. This was the moment when insufficiences in research on the Black Tents, as structures withstanding harsh weather conditions and giving a comfortable shelter, were noticed.

There is another aspect of the research which is also important: durability of the elements of the tent. Rate of exchange of the elements is different. Some stay in good condition for a long time and some must be exchanged often. This will be also one of the thread of the research.

Scope of initial research allows to formulate the Thesis of the dissertation.

Black Tents used now by the tribes of Iranian nomads differ due to:

- local tribal cultures arising from thousand years' tradition
- flexibility of structures is adjusted to diversified climate and emerging from nomadic life
- building crafts perfected within the tribes using local materials, which created the Tents' structures strictly adapted to climatic situation of the regions where they live

For nomad tribes living in highlands and lowlands of Iran the Black Tents provide flexible, multifunctional interiors for everyday life and festivities.

Developed typology of the Black Tents of the seven tribes, experiencing different geographic situations and adhering to their idiosyncratic traditions provides ground for protection and conservation of the Black Tents and nomadic life in Iran.

There are several subjects that will be researched simultaneously:

- time-line of development of Black Tents as a type of Iranian nomads' habitat
- identification of existing trails of nomads in different weather conditions
- survey of the types of the Black Tents
- classification of the forms of the Black Tents
- classification of constructions of the Black Tents
- analysis of methods of erecting the Black Tents
- classification of used materials and time-line of durability of different elements of the Black Tents
- research on how wide is knowledge on constructing the Black Tent among young Iranian nomads
- perspectives of nomadic life in Iran
- updating the guidelines for protection and conservation of Black Tents.

1.5 Concept of the work

This research comprises of three main parts: theoretical, practical and summarizing.

The first part is focused on collecting scientific data for further work. This means:

- research on history of nomad tribes living in Iran and Black Tents
- historical studies, to specify evolution of the Tents and the time they were recorded for the first time.
- literature and internet search to specify the areas where nomads live
- climatic studies of those areas
- ethnographic studies concerning everyday life in summer and winter, habits and festivities of Iranian nomad tribes with reference to the interiors of the Tents
- placing Iranian nomads within a group of nomadic peoples living throughout the world.

The second part concentrates on the structures of the Tents and their finishes and details. In situ survey of the summer and winter Black Tents of chosen nomad tribes will include:

- technical drawings, photographs, descriptions of structures/skeletons, covers, fastenings, equipment of the interiors
- comparison of temperatures differences outside and inside the Tents in winter and summer conditions
- comparison of water resistance of the Tents' covers
- analysis of the ways of folding and unfolding the Tents
- interviews concentrated on providing and preparing materials used for construction of the tents (wood, hides, straps etc.)
- interviews concerning ability to construct a Tent by young women/men of the tribes
- interviews concerning attitudes towards nomad life among young women/men of the tribes

In the third part, the conclusions are focused on forming typologies and making comparisons:

- typology of forms of the Tents typical for different regions of Iran
- construction of digitalized models of different types of the Tents according to collected data
- assessing ability of the Tents' structures to withstand particular weather conditions in summer and winter experienced in the regions of their summer and winter locations

Furthermore, it would be possible to draw conclusions concerning conservation of existing constructions and to provide instruments for encouraging the nomad way of living.

1.6 Research methodology and applied methods

Methodology of the research is in the most of aspects shown on the Chart of the research (Fig.3). Structurally the research develops in two lines: theoretical including inquiries in libraries, archives, official web pages, and practical based on in situ activities. They intersect in several points allowing to check fragmentary results of the research. Drawing conclusions and directing correcting feedbacks upward, takes place at the end of each sub-chapter.

Several methods are employed throughout the work.

Literature analysis and review: information will be obtained from books, periodicals, recognized web pages, official documents, archives, conference papers etc. Analysis of these texts will allow to set the research within contemporary knowledge on the subject, with aim to widen its scope. It will specify time horizons of gradual changes in attitudes towards the basic issues of the work, give opportunity to compare occurrences and rectify the details of the research.

Author's experiment: participation in migration of several tribes, in order to obtain needed information is a part of the research.

Surveys in form of inventory drawings, sketches, tables, photographs and taped interviews will allow to supply data concerning structure, materials, constructing processes and cultural issues.

Computer aided research on structural properties of Black Tents based on software such as 3DMax, ABAQUS and other professional civil engineering digital tools allows to obtain comparable results.

Graphic methods including comparative tables and charts in summarizing parts of the research.

The following scheme refers to the course of this research:

- the problems discussed
- actions undertaken
- cooperations accomplished
- finally implemented structure of the work

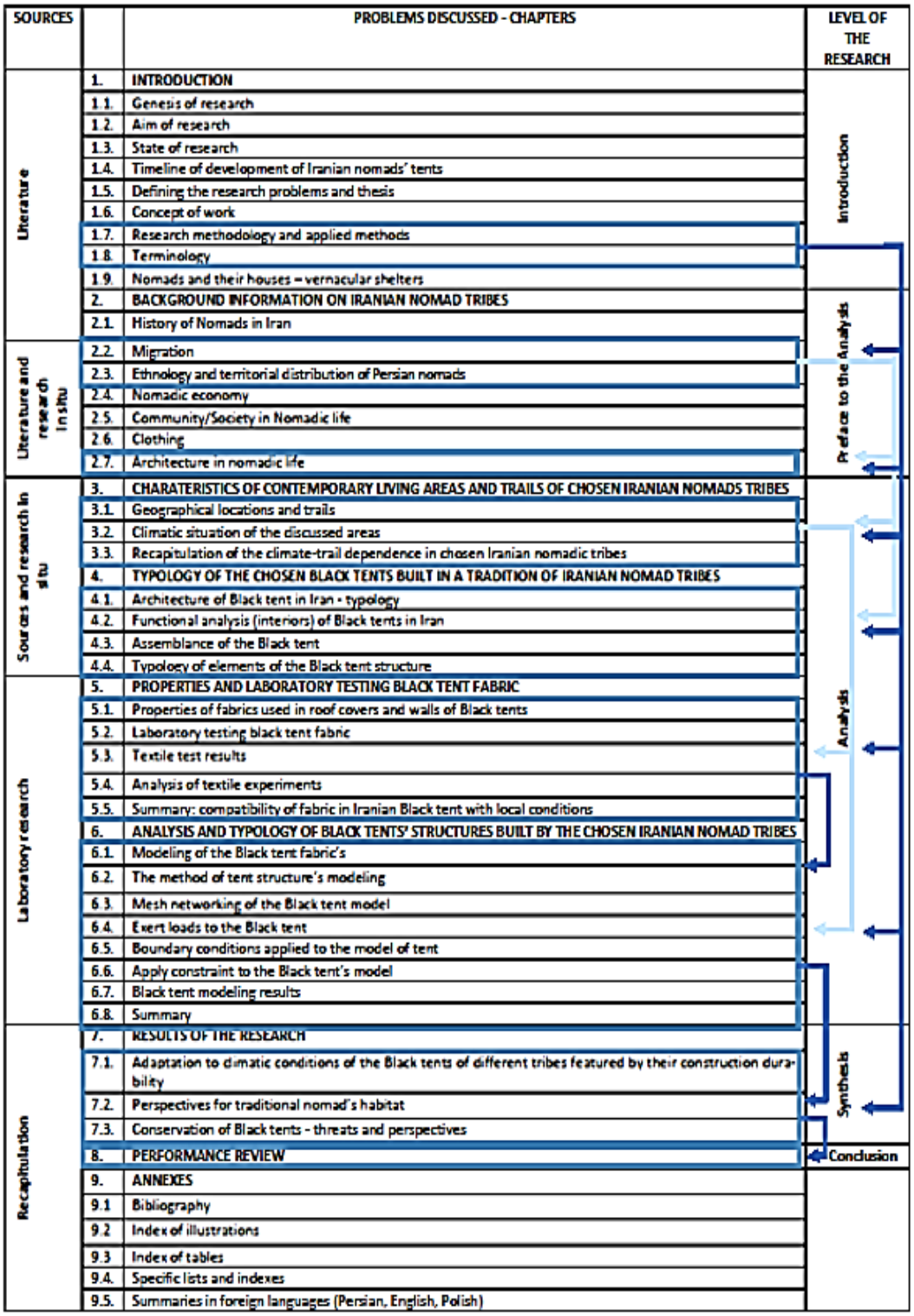


Fig.3: Chart of the research indicating relations between its parts, including feedbacks between the chapters.

1.7 Terminology

Although professional architectural language: words, phrases and their meanings tend to unify throughout the world, there are still enclaves where the real meaning of the technical term must be described or, even better, drawn. This concerns vernacular

architecture in particular, as local names of structural elements even in Europe differ from town to town. In case of Persian language and its many local dialects it is vital to attach short dictionary of terms as they will come up in course of the research, referring sometimes to graphic presentation. Several basic terms included below exemplify this problem.

Chador: a tent; in Europe known mainly as a garment
Siah Chador: Black Tent
Alachigh: shady place, canopy used also as a name of a part of a tent
Yelagh: summer quarters
Qeshlagh: winter quarters

The scope of terminology employed in the literature is wide and covers fields of sociology, ethnography, history of art and architecture. As Persian language is not translatable into English in 1:1 way in some cases, wider descriptions must be included.

Names of the elements of the tents in this text are used according to author's translation from the local name and some according to a specialized Dictionary:

Column – for central element supporting roofs
post – for side elements supporting walls
ridge beam – created ridges as a continuous horizontal line and the ridge of the tent was conceived
peg– a piece of wood beaten, pounded into ground
loop – made of soft rope to connect the edge of fabric to wooden hook
hook – timber element between loop and rope, allows to adapt the length of a rope
ropes – are pleated with goats' hair

In case of equipment and furnishings of the tent, terms which are used in English rely on British/European connotations, as saddlebag, sack, etc.

1.8 Time-line of development of Iranian nomads' tents

Fig.4. Painting from Leili & Majnoon Book, (1480.AD), artist is unknown, source: Feilberg, C. G. 1980, p.322.

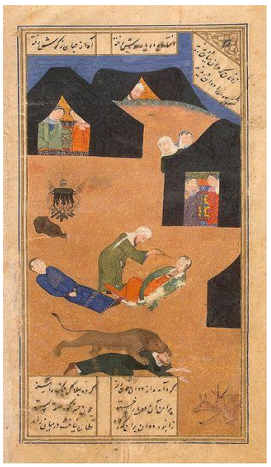


Fig.5: Painting from Khamse Nizami Book. (1431.AD), artist is unknown, source: https://fa.wikipedia.org/wiki

On the basis of the literature and iconography it will be possible to draw the time-line of development and diversification of this type of Iranian nomads' habitat. It was

developed many centuries ago. Book miniatures from the 15th century show ready developed form of a Black Tent and this are the first records of its recognizable form (Fig.4,Fig.5).

Due to the diversity of climates and cultures a variety of shapes and structural solutions emerged, as well as a diversity of internal arrangements. On the presented miniatures, there are already two types of tents visible. These types are still in use now in the different parts of the country.

Yurts, which were not so long ago in use in the north-east of the country were closely related to Mongolian shelters - yurts, a well-known structure. On the other hand, Moroccan Berbers' tents show some similarities with particular Iranian tents.

This is an indicator that none of the cultures developed in the void. To trace the paths of these vernacular connections and appropriations, poses, so far, an unsolved problem.

1.9 Nomads and their houses – vernacular shelters

There are two types of settlements used by nomadic peoples: fixed and movable.

Transhumance is a seasonal movement of herders with their animals between two fixed summer and winter homes with their pastures. Examples of remaining ruins of fixed shelters can be found in Europe: Scotland (Shieling)[5] and Wales (Haford)[6]. The families of herders were spending winter mostly in villages in valleys and in spring they moved to their summer, built of stone houses. From this way of life another model emerged, well known from Polish Tatra Mountains: the shepherds (men) from the mountain villages during summer months moved their flocks and grazed them in pastures distant from their villages. They lived in summer timber huts (szałas), that provided also space for activities such as milking, cheese making and shearing their sheep.

Fig.6: Scotland, source:http://naturalhomes.org/timeline/shieling.htm

Fig.7: Innuit's igloo, source:http://pixdaus.com/simulated-inuit-igloo-constructed-near-nome-alaska-see-comme/items/view/236582/

[5]A shieling is a hut once common in wild or lonely places in the hills and mountains of Scotland and northern England. The word also refers to a mountain pasture used for the grazing of cattle in summer, implying transhumance between there and a valley settlement in winter. (https://en.wikipedia.org/wiki/Shieling)

[6]The summer mansion of Uchtryd is a wooded and landscaped estate, located in Ceredigion, west Wales, in the Ystwyth valley. (https://en.wikipedia.org/wiki/Hafod_Uchtryd)

This group of shelters includes also igloos. Eskimo igloo is the winter home for the family of herders, who spent summer months moving with their reindeers, or fishermen, in summer working along the shores.There are three traditional types of igloos, all of different sizes and used for different purposes.

- The smallest were constructed as temporary shelters, usually only used for one or two nights. These were built and used during hunting trips.
- Intermediate-sized igloos were for semi-permanent, family dwelling. Several of these set in a small area formed an Inuit village.
- The largest igloos were normally built in groups of two: one as a temporary structure built for special occasions, the other built for living. Big, habitable igloo might have had up to five rooms for up to 20 people.

Movable structures were built on all continents, including Australia.
Usually they had timber frame constructions covered either with hides or with fabric made of locally available animal hair, which made the cover impermeable for water and wind. A number of different arrangements were invented to allow fire inside the tent. This entailed intricate sometimes methods of ventilation.
Most similar to Iranian tents are the structures of Berbers/Tuaregs shelters. Most of the tribes live nomadic life, moving with their sheep and goats, and take advantage of better weather, in a similar way, as Iranian nomads do. Their winter and summer tents differ, similarly as in Iran. Often the extended family have a few tents with a wall around them, with a garden and a compound to keep the herd in when needed. They live mainly in Saharan districts of the Maghreb: Algeria, Tunisia, Libya, Mauritania and Egypt. There are several documented styles of Berbers tents, some covered with hides, some with fabrics and some with straw mats. As migration of the tribes on long distances happened quite often, the possibility of mutual cross-inspiration with Iranian tribes is the one of the possibilities.
The tents are also built in historical Tibet, now within Tibet and China administrations. Their covers were woven with yak wool, and under the central opening at the top of the conical structure, there was a place for fire.

Fig.8: Jezyds' settlement https://maciejkowalski-birds.blogspot.com/2016/10/gruzjaarmeniaIII.html access 12.02.2021

Fig.9: Mongolian /Iranian Yurt, source:https://www.nationalgeographic.org/encyclopedia/yurt/

In the Caucasus, in Kurdistan, Iraq, Armenia and Georgia tents of Jezyds can be found. They also have a lot in common with Iranian Black tents, as they use similar materials,

structures, and are meant to move with the herders' families. They have never achieved the flair of Iranian Black Tents, due to harsh climatic conditions and less time for artistic approach to the interiors. The harsh weather made them move not between the summer pastures and winter quarters, but to flee for safety. They live mostly in protected camps across at least three countries. Their tents are now supplied by the worldwide relief organizations and are made of plastic elements, sometimes insulated for winter and sometimes not. It seems, that the art of constructing family tents, decorating them and using them in traditional way is lost, as the second generation of fugitives is growing without possibility to continue the thousand years old tradition[7].

On Asian Continent yurts seem to be built on the vast area spreading from Central Asia towards the South. Their construction is known for at least three thousand years – Herodotus mentioned this traditional way of construction (Frankopan P., 2015, p.105). The structure comprises light timber elements for walls and solid door frame. Ribs of the dome keep the regular shape of the wall. The cupola and the walls are covered with hides and bound with leather bands. Important element of the structure is the top ring, to which the ribs are attached. It provides an opening, under which the fire burns (Rapoport A., 1969, p. 34).

On the American Continent two types of movable tents were established before the colonial era: wigwam and tipi (tepee).The tent structure of a wigwam, (*wickiup* or *wetu*) are domed dwellings used by Native American tribes. The different names are ascribed to the different parts of the USA and Canada. These structures are formed with a frame of arched wooden poles, covered with some sort of material. Details of the constructions vary with the local availability of materials. Wigwams were covered with grass, brush, bark, rushes, mats, reeds, hides or man-made cloth. They were most often seasonal structures, not so easily dismounted for travel as much lighter tipis. Usually the parts of the frame of a wigwam remained on the spot, while the covers, especially skins and fabrics were taken by the family (Rapoport A., 1969, p. 28).

Fig.10: Native American tipi, source:http://www.wallswithstories.com/uncategorized/teepees-the-iconic-dwellings-of-nomadic-native-american-tribes.html

Fig.11: Romani's vardo, source:https://rozvitok.org/en/vardo-how-did-it-resemble-the-romani-caravans-the-story-of-the-roma/

[7]The only country in which Jezyds form a recognized minority is Armenia. They are and were persecuted in Turkey, Iran and now in Iran by ISIS. (https://repozytorium.kul.pl/bitstream/20.500.12153/941/1/Wawrzynczyk_Rafal_Przesladowanie_religijne_irackich_jezydow_przez_Panstwo_Islamskie_Przyczyny_przebieg_odpowiedzialnosc_wspolnoty_miedzynarodowej_za_ukaranie_sprawcow.pdf)

The tipi's conic, slender shape was constructed for short, temporary (summer) stay. Made of brush and covered with animal skins, it had a place for a fire in the centre. Therefore, it was equipped with characteristic smoke sleeves/flaps at the top of the structure. These openings were operated by a rod. Together with the entrance they created ventilation system efficient in every situation. Tipis could be disassembled and packed away quickly when people need to move with their cattle and could be reconstructed quickly while settling in a new area.Together with wigwam it created winter/summer seats for nomadic Native American tribes (Tobolczyk M., 2008, p. 55).

In the Somalian land, as well as in the Southern Africa, similar to wigwam, domed structures (*aqal*) were used by indigenous peoples (Kelm T., 2007, p. 29.)

Australian Aborigine built temporary shelters around a trunk of a tree. A *humpy* was rather small. The structure was made with branches and bark. It was not meant for moving, but it created a temporary shelter while undertaking building of a permanent house or in time of a hunting expedition (Tobolczyk M., 2008, p.34).

Romani's *vardo* design is not as old as the vernacular structures discussed above, but *vardos* moving in single file on the roads of Europe, from town to town, made a part of its' landscape during the 19th and beginning of the 20th centuries. The cart features include large wheels set outside its body, whose sides slope outward. Over it a canvas barrel vault was stretched on timber frames, or a wooden, gabled roof was rising. The cart was drawn by horses or mules. Inside, apart from the furniture and bedding (depending on the period, place and wealth of the owners) the stove was often placed, and its metal chimney stuck above the roof. The *vardos* were decorated inside and outside in the most beautiful way with paintings, hanging curtains and different dangling with the cart's movements decorations (Nyka L., Szczepański J., 2019).

Similar "wandering" houses were used by theatrical groups in Europe and America from the half of the 18th century till the beginning of the 20th century.

Caravans of wagons similar to that of Romani people, were organized by settlers in the United States, for migration to the West during the late 18th and most of the 19th centuriesand then, in the early thirties in time of the Great Depression, already by trucks, in the USA (Steinbeck J., 1990).

It is difficult not to mention in this place contemporary nomads, who, in vans or caravans travel across the USA and Europe, creating a continuity of the wandering tribes of the past. Resources which they need now include the spectrum of vernacular demands, plus Wi-Fi if possible, although some of them would rather live at their homes, which they lost. The film "Nomadland" – Oscar prized in 2021 tells the story of those people.

2 BACKGROUND INFORMATION ON IRANIAN NOMAD TRIBES

2.1 History of nomadism in Iran

There has never been a census of pastoral nomads in Iran. In 1986 census officials estimated that nomads totalled 1.8 million. The number of tribally organized people, both nomadic and sedentary, may be twice that figure, or nearly 4 million. The nomadic population practices: transhumance, which means migrating in the spring and in the fall. Each tribe claims the use of fixed territories for its summer and winter pastures and the right to use a specified migration route between these areas. Frequently summer and winter camps are widely separated, in some cases by as much as 300 kilometres. Consequently, the semi-annual migrations, with families, flocks, and household equipment, may take up to two months to complete. The nomadic tribes are concentrated in the Zagros Mountains in west, but small groups are also found in north-eastern and south-eastern Iran (http://countrystudies.us/iran/51.htm).

During the Qajar period (1795-1925), when the central government was especially weak, the nomadic tribes formed tribal confederations and acquired a great deal of power and influence. In many areas these tribal confederations were virtually autonomous and negotiated with the local and national governments for extensive land rights. The largest tribal confederations, such as those of the Bakhtiari and the Qashqai, were headed by a paramount leader, or "*ilkhan*".

Reza Shah moved against the tribes with the new national army that he began creating while minister of war and prime minister (1921-25). After he became shah, his tribal policy had two objectives: to break the authority and power of the great tribal confederation leaders, whom he perceived as a threat to his goal of centralizing power, and to gain the allegiance of urban political leaders who had historically resented the power of the tribes. In addition to military manoeuvres against the tribes, Reza Shah used such economic and administrative techniques as confiscation of tribal properties and the holding of chiefs' sons as hostages. Eventually, many nomads were subdued and placed under army control. Some were given government-built houses and forced to follow a sedentary life. As a result, the herds kept by the nomads were unable to obtain adequate pasturage, and there was a drastic decline in livestock. When Reza Shah abdicated in 1941, many nomadic tribes returned to their former life-styles.

Mohammad Reza Shah continued the policy of weakening the political power of the nomadic tribes, but efforts to coerce them to settle were abandoned. Several tribal leaders were exiled, and the military was given greater authority to regulate tribal migrations. Tribal pastures were nationalized during the 1960s as a means of permitting the government to control access to grazing. In addition, various educational, health, and vocational training programs were implemented to encourage the tribes to settle voluntarily (Baharvand, A, 1981, P. 84).

Following the Revolution, several former tribal leaders attempted to revitalize their tribes as major political and economic forces. Many factors impeded this development, including the hostile attitude of the central government, the decline in nomadic populations as a result of the settlement of large numbers of tribespeople in the 1960s

and 1970s, and the consequent change in attitudes, especially of youth raised in villages and towns.

By the mid-1980s, it seemed that the nomadic tribes were no longer a political force in Iranian society. For one thing, the central government had demonstrated its ability to control the migration routes. Moreover, the leadership of the tribes, while formally vested in the old families, effectively was dispersed among a new generation of non-elite tribespeople who tended to see themselves as ethnic minorities and did not share the views of the old elite(http://countrystudies.us/iran/51.htm).

Looking at the old paintings, we can check and compare with the nowadays Black Tents. In the oldest miniatures (traditional paining in Persian art), during the Timurid era, we see tents that look like today's Tent.

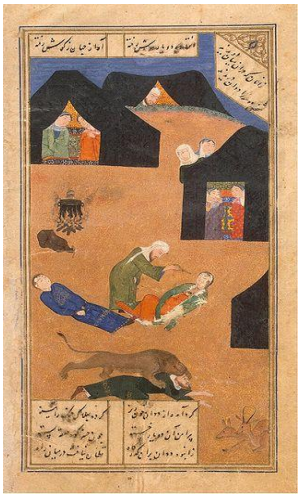


Fig.12: The shape of these tents is similar to the black tents of the Fars province, source: Pups, A.A., 2005, p. 101.

Fig.13: Seven Oranges Jami. No 231. Attributed to Mozaffar Ali. source: Pups, A.A., 2005, p. 132.

Fig.14: Khamse Nezamie, 1539-1543, Mir Sayyid Ali's work's, British Museum. source: Pups, A.A., 2005, p. 118.

Fig.15: About 1480, artist unknown, source:Filberg. C.G.,1980, p. 62.

Fig.16: About 1480, artist unknown, source:Filberg, C.G., 1980, p. 63.

Fig.17: Khamse Nezamie, 1539-1543, Mir Sayyid Ali's work's, British Museum. source:Pups, A.A., 2005, p. 119.

Filberg writes in his research that he had arranged and sent the Black Tent to Denmark National Museum, a Tent belonging to the Papi tribe. This tribe is from west of Iran. That

tent has a roof cover and two walls. The historical information that he offers, Indicates the origin of the Black Tent of Asia (Filberg, C.G., 1980, p. 62-63).

Fig.18: The black tent purchased by Edenberg.Part of ethnography of Mosgard museum. 1964, source:Filberg, C.G., 1980, p. 63.

2.1.1 Definitions

In Persian texts the words *ʿašīra*, *qabīla*, *īl*, *ṭāyefa*, *ūymāq*, *ūlūs*, and especially their plurals *ʿašāyer*, *qabāyel*, *īlāt*, *ṭawāyef*, *ūymāqāt*, *ūlūsāt*, are often used as synonyms with the general meaning of "tribe," and in Persian dictionaries they are explained as "lineage, clan, family," or sometimes "community" or "body of troops." Such explanations are of no help for understanding the actual diversity of tribal groups.

There is no agreement, even today, on the precise criteria to define tribes and distinguish them from the other groups. The effort to find a definition began long ago.

One of the first thinkers to discuss the social characteristics of them was the historian Ebn kaldun (1332-1406). In his analysis, they are "people who make their living by rearing animals and are obliged to move and roam in search of pastures and water" (Ebn kaldun, 1973, p. 228). The reason which holds such people together in a tribe is the communal pride which springs from shared ancestry and finds alliance. Consequently, these peoples, unlike sedentary peoples, attach more importance to descent or lineage than to domicile (Ebn kaldun, 1973, p. 243-245).

While Ebn Kaldun's experience was mainly of the Arab and Berber tribes of North Africa, more or less similar characteristics can be found in other tribes. Among Turkish-speaking groups, the word "īl" not only meant tribe but also had connotations of obedience and friendship.

Rashid-al-din Fazlallah[8] (ca. 1247-1319) wrote in his history book's that "they (the Tatar people) were at most times friendly and obedient (īl) and tributary to the kings." (Fazlallah, R., 1965, p. 159).

The research of W. Irons (Nomadism as a Political Adaptation: The Case of the Yomut Turkmen), among the present Turkmen of Iran the word "īl" is applied primarily to a

[8]Rashid-al-din Fazlallah (1318-1247), was a statesman, historian and physician in Ilkhanate-ruled Iran. Rashid al-Din became the powerful minester of the Ilkhan, Ghazan. Later he was commissioned by Ghazan to write the Jami al-Tawarikh, now considered the most important single source for the history of the Ilkhanate period and the Mongol Empire. He was a prolific author and established the Rab'-e Rashidi academic foundation in Tabriz. https://en.wikipedia.org/wiki/Rashid-al-Din_Hamadani

group of tents (ūba[9]) whose occupants keep together and live in peace and amity; these groups then form wider confederacies which locally are also named "īl" (corresponding to the "walāʾ" of Ebn Kaldun). At the same time "īl" is used as an adjective to describe relations between tribes, meaning "at peace with" as against "yāḡī" (at war with). Membership of an "ūba" and and "īl" generally depends on genealogy. The members of an "īl" perceive their community as made up of small and large patrilineal descent groups, the smallest consisting of brothers, i.e., sons of the same father, the next of brothers and nephews, i.e., descendants of the same paternal grandfather, the third of descendants of the same great-grandfather in the male line, and so on back to the common ancestor of the whole "īl"(Irons, W., 1974, p. 640-42).

Philip Carl Salzman's studies of the Baluch tribe in the Sarhad district (south and southeast of Zahedan), such as the Yar Ahmadzehi and the Gamshadzehi, confirm the importance of descent-based organization. These tribes are constantly on the move, either to gather dates from palm groves in the lowland or to find pasturage for their sheep in the Sarhad highland. The spatial distribution of them depends on family relationships. In matters such as marriage, prayer, house building, seasonal migration, disputes, etc., lineage is thus the main consideration, not "vicinage." The territorial groups are themselves formed from descent groups, and their bonds of common descent are reinforced by matrilateral and affinal ties (Salzman, P.C., 1972, p. 63). The Baluch tribes enter into large and small confederacies on the pattern of Ebn kaldun's "walāʾ" and "ḥelf".

Brian Spooner has described a confederacy of five "leading" tribes of Iranian Baluchistan, namely the Barakzi, Mir Moradzi, Bozorgzada, Bolidaʾi, and Sirani, to which the Mobaraki also adhered in 1963. It seems that these tribes, together with others, the Rigi and the Esmailzi (Sabaks), then had a dominant influence throughout Iranian Baluchistan and that the remaining tribes were all in some way attached to them (Spooner, B., 1964, p. 60).

Iran has different nomadic tribes and their territories are in different regions of the country. Their environments vary, and generations of nomads learned not to try to harness the powers of nature and to take them in control, but to use nature as much as it is possible to their benefit.

In research of lives of tribes many issues must be examined, including nomadic tribal structure, social relations, economic aspects of their cattle breeding, customs, settlements etc. Some of them are basic for this research. Until now many studies in this field have been done already, but none of them was focused on the role of the house as a result of subordination to the potency of the environment**.**

In studies conducted by the author in the last few years (case study of the Qashqai Tribe, Fars Province, Iran), the tribal housing structure was carried out and its stability was checked by ABAQUS software for the first time. Following this research, Qashqai Black Tent in Fars Province was registered in Iranian National Heritage Index in September of 2012.

[9]Between Turkaman tribe in north of Iran, they called ūba to tent. Their tent is a little similar as mongulian tent.

Author recorded also course of its erection and folding down. The record included all the activities allowing to work out the ways of maintaining and conserve its elements (Hassas, N, 2012, p.150). This record was sent to Iranian Heritage Committee and accepted. The tent is now on Iranian Intangible Heritage List and undergoing UNESCO procedures to be included on the world list[10].

2.2 Migration

2.2.1 History of migration in Iran

In fact, there is no evidence of how various forms of prehistoric migration emerged. Hypotheses are based on the studies and deduction on the lives of peoples from the early stages of civilization in the world.

Primitive humans (families) lived by collecting the roots of the plants and fruits of the forest trees and hunting wild animals. At this stage of the evolution of culture, which is called the hunting season, they moved from place to place as small groups of several families to find food and hunt animals. At the stage of pastoral economics, with domestication of animals, humans move in a new way of life. Since then, humans have been displaced to provide livestock food and adapt to natural conditions following livestock pastures and grasses (Nik Kholgh, A., 1990, p. 47).

Nomadism has three main characteristics that distinguish it from other types of social life:

- human affiliation to the animal
- use of natural pastures
- people and livestock movement in order to take advantage of natural pasture and avoid extreme heat and cold (Nik Kholgh, A., 1990, p.13)

Some believe that nomadic life is between 7000 and 8000 years old. The ancient Toulei[11] Hill comprises the oldest traces of nomads, dating to more than 8 000 years. But this does not mean that nomadism in all parts of the world has such an ancient background. For example, according to research done by Cascal in 1979, on the genesis of immigration in the Arabian Peninsula, it has been concluded that this life has expanded nearly 12 000 years ago, after the collapse of the Arab state of southern Arabia.However, migrant life seems to have evolved in different parts of the world at different times and in various motivations (Baharvand Amanullahi, S., 1981, p. 26).

Until the fourth millennium BC, the tribes did not have long migrations distance, but from then on, shortages of rain and forage forced them into distant migrations.The livestock tribes in North Africa and Central Asia migrated for the first time from plains and forests(Moshiri, R., 1983, p. 32).

According to Schmidt and Koppers in the book of nations and cultures,the starting point for animal husbandry has been from Central Asia to the Southwest.They believe that the Sami tribe Is likely to be the same group that existed in the Southwest of Asia and lived

[10]List of intangible heritage of Iran, Number of registration: 523. Fars Ministry of Cultural Heritage.

[11]Between Turkaman tribe in north of Iran, they called ūba to tent. Their tent is a little similar as mongulian tent.

on the Iranian plateau, Nomads and breeders of domestic animals and infiltrated Mesopotamia towards Saudi Arabia and from there to Africa (Feilberg, C.G., 1980, p.168).Hugo Grote speaks of people behind the mountains, Lore tribe, in the west of Iran. He points to the brown tent of a wool of goat's hair as the home of these people (Feilberg, C.G., 1980, p.169).

Robert Ker Porter wrote about Bakhtiaritribe: they lived under the black large tents during the summer. The sides of the tent were covered with a matt, and the tents were usually rectangular (Feilberg, C.G., 1980, p.170).

Demorgran writes about the tent of the Kurds: the roof of the black tent is woven from goat's hair. The both sides of the tent have a slope and are tight with sturdy hooks (Feilberg, C.G., 1980, p.170).

According to Herodotus, in course of Persian Wars a large tent for Khashayar King was built, almost identical to the genus of nomadic tents (Feilberg, C.G., 1980, p.171).

Feilberg has studied western Iran, such as the Poppies tribe in Lorestan, Nikiton has researched Kurds tribes and Barot has researched Baseri tribe in Fars, but they are not responsive to our historical survey (Feilberg, C.G., 1980, p.171).

Fig. 19: Carpet weaving in the tent of the nomadic Fars, source: Dieulafoy, J., 1982, p.473

Fig. 20: Tribal women during a making the butter outside the tent, Khuzestan Province, source: Dieulafoy, J., 1982, p.669

According to Dieulafoy, the tent of the Fars tribes consists of five pieces of fabric woven from goat's hair. The horizontal ceiling is supported by posts and the fabric is fastened to the ground by ropes and pegs. The saddle bags That are full of belongings are kept on the south side of the tent. The northern part of the tent is higher and forms a kind of a porch. At the far end of the tent the carpet weaving machine was standing on the ground. (Dieulafoy, J., 1982, p.472-473)

In some letters by travellers, there were photographs, drawings and engravings enclosed, showing tribal tents.

Fig. 21: Khuzestan nomads, source: Dieulafoy, J., 1982, p.619

2.2.2 Migration (Kuch) in Iran

Nomads are the people who migrate from one place to another with their tribe, family and all their belongings. Migration is a way of life for nomads in which cattle is the basis of their economic life. Staying in a temporary location and living on a trail by nomads' groups are two outstanding characteristics of nomadic life.

Iran is so geographically diverse that, in one single region, we can find all sorts of climates, in just a couple of hundred kilometres.

For example, for Qashqai tribes, the area in the Persian Gulf has a very similar climate to the Arab countries, such as theUnited Arab Emirates, Saudi Arabia or Qatar. In winter, these countries have one of the most pleasant winters that exist but, in summer, the heat becomes unbearable and the air extremely humid. Or in the Zagros Mountains, whose southern part begins pretty much in the Persian Gulf, the weather becomes more mountainous and much cooler, many sections having really tough and freezing winters and, at the highest point, the altitude is 4,409 meters above sea level.

Fig.22: Migration of Qashqai tribe from Persepolis,1936, source: Chicago University Library

This is the main reason why, for centuries, this land has been inhabited by different nomadic groups, who have kept moving across the 400-kilometer strip. In winter, they remain in the Persian Gulf and, when the weather becomes hot, they start moving north. In spring and autumn, you may find the nomads of Iran in the mountains around Shiraz and, in summer, around Isfahan.

Every time they move, they need to pack all their belongings, move with their flocks and set up their camps again. The samegoes over and over.

The nomads always need to get water from the river, rely on solar energy and are highly dependent on their flocks. They are self-sufficient and their herds of sheep and goats are their main source of income.From these animals, they get meat, cheese, and milk and they also sell the new-borns at the markets of the different cities.
Therefore, it's not surprising at all that, for the last few decades, many nomadic people have left their traditional life and moved to different towns and cities (Moshiri, R., 1983, p. 72).

2.2.3 Summer place (Yelagh), winter place (Qeshlagh) and migration rituals

There are two kinds of the tribe's migration: horizontal migration occurs in dry, flat, vast deserts where water and grass can scarcely be found like in Saudi Arabia 's deserts. Vertical migration occurs in regions with large difference in altitude where people move from low altitudes to higher ones in search of more favourable weather for their families and their animals, like in Iran (Nik Kholgh, A., 1990, p. 39).
During their seasonal migrations, nomads move with their animals, from winter resort locations to summer grazing lands. Then they move back to their winter resort locations again when it gets cold. The daily routine of the Iranian nomads is pretty much the same. They wake up in the morning with the sunrise and men leave with their herds, while women stay at the camp, working on the daily household chores.
Migration has started many centuries ago. Research on nomadic way of life unveiled that this phenomenon exists mostly in semi-dry, and arid territories, i.e. in areas where there is not any suitable piece of land for farming, like slopes or stony grounds. There are various theories concerning the causes of such a way of life: increase of population and expansion of agriculture, pushing out the herders from fertile land, economic structure of a given community, social and political situations generating migrations and ecological factors (Moshiri, R., 1983, p. 74).
Preparations for migration concentrate on packing all the belongings for travelling, as everyday activities must be performed all the time.
When everything is already in special colorful and nice woolen bags or saddlebags wrappings, these packs are bound with handmade woolen strings on top of their animals. Today however, the nomads use also cars and pick up for easier and quicker movement (Kiani, M., 2006, p. 26).

Fig.23: Woolen saddlebags for keeping and packing nomad equipment, source: http://www.mirzaie.loxblog.com/post/38

Fig.24: Packing for migration in a traditional way, source: www.fars news agency

1. Tent fabric (Roof) 2. Alachigh 3. Rope 4. Post

Fig. 25: Packing up a Black Tent in Qashqai Tribe during migration time, source:http://dostaneshahr.persianblog.ir/tag

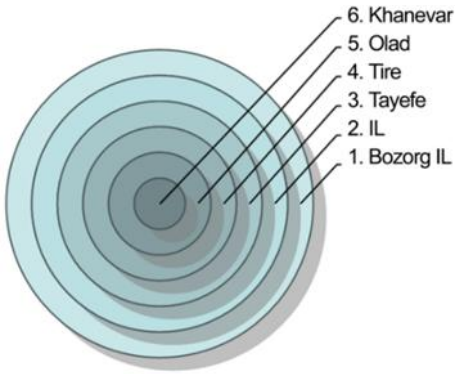
2.2.4 Migrants, semi-migrants and settled tribes

The differences between villagers and nomads' ways of life have frequently ended in quarrelling and at times in dependence upon each other. Nomads could have been a major threat to villagers but also could have satisfied their needs.

Some tribes are merely tent dwellers and move in search of grazing lands for their herds. Other tribes are both living in tents and in some specific buildings. Agriculture is another minor thing they do for their needs. The third group has gone through previous stages and has settled at last as a result of decline in traditional cattle herding (Nik Kholgh, 1990, p. 40-42).

2.3 Ethnology and territorial distribution of Persian nomads

Fig.26: Map of the dispersal of the Iranian people, source: http://caspian-nejat.mihanblog.com/post/48



1. Big Tribe, 2. Tribe, 3. Clan, 4. Race, 5. Phylum, 6. Family; (translated and designed by author)

Fig.27: Diagram of social organization in Nomadic system, source: Baharvand, A., 1981, p.197.

There is no comprehensive and accurate list of the tribes of Iran and their locations. In the present state of knowledge and in the absence of agreement on uniform definitions, compilation of such a list would hardly seem practicable. For example, it can often be seen that one writer treats a Tayefe[12]forming part of an Il as an independent tribe, and that another writer treats the same unit as a Tire forming part of a Tayefe. The available lists are therefore not mutually comparable. Moreover, the tribes themselves constantly evolve. The name, composition, abode, means of livelihood, and even language of a tribe can change.

Ethnic categorization of the tribes is generally based on present conditions rather than historical origins, because many tribes which are today regarded as Kurdish or Turkish were in past times described as Lor or Lak, and vice versa. For example, the Torkashvand of Hamadan province are of Lor origin, but after moving to their present abode and coming into contact with Kurdish neighbours, such as the Jomar, they gradually adopted the Kurdish language (Borqai, M., 1977, p. 3); they have therefore been placed in the category of Kurdish tribes. Although there are linguistic and ethnographic grounds for belief that the Guran in the provinces of Kermanshah are not of Kurdish origin (Minorsky, V., 1943, p. 75-103), they are today counted as Kurds. Likewise, the Agha jari tribe, now counted as one of the Lor tribes of the province of Kohkiluyeh-Boir Ahmad, were originally Turks; according to Rashid-al-din Fazlallah, a section of the Ghozz (Oghuz) Turks who camped in scrub lands were called Agac-Iri, i.e., scrub-dwellers (Fazlallah, R., 1965, p. 108). In Sistan province there is a small tribe known as the Kurds, of well attested Kurdish origin, that is now so assimilated to the Baluch culture that they have to be classed as a Baluch tribe. Many more instances could be cited.

[12]The diagram above and the sub-chapter 2.5. refer to the structure of nomadic community.

2.3.1 Lor and Lak tribes

The Lor tribes live mainly in the mountains of south-western Iran, but a few small groups are found in Khorasan province and in the Sirjan and Rudbar districts of Kerman province.

Information about the Lor tribe in the Mamasani in Fars province is scarce, but it is known that a Mamasani confederacy seized Shulestan district early in the 18th century and there by established another Lor domain, hence known as Mamasani, between Kuhgiluya and Shiraz. The cities of that name, lying north of Kāzerūn and west of Ardakan and having its center at Nurabad. They are now almost entirely sedentarized.

Lor tribes collectively known as the tribes of Kuhgiluya and Boir Ahmad province. Formerly part of Fars province, the territory became a separate province in 1976. According to reports written in the 1960, the inhabitants were then divided into three tribal groups (Afshar Naderi, N., 1968, p.113; Safinezade, A., 1968. P.56).

The Bakhtiari or Great Lor tribes are one of Iran's most important seasonally migrant communities. Their territory lies in the central Zagros north and west of the Kuhgiluya and Boir Ahmad territory. They are divided into two component parts (boluk), the Haft Lang and the Chahar Lang. The first official appointment of a Bakhtiari head's took place in 1867 by the order of Mohammad Shah Qajar. This office, which ranked second in the tribal hierarchy, were abolished in Reżā Shah's reign (Rawlinson, H., 1839, p. 26-116; Garthwaite, G.R., 1969; Garthwaite, G.R., 1978, p. 173-197; Wilson, A.T., 1926. p. 205-225).

The Little Lor tribes live in the Lorestn and Ilam provinces (a separate province since 1974), i.e., the region between the Dez river in the south and east, the Iraqi frontier in the west, and the Kermanshah province in the northwest and west. Many of these tribes are now sedentary, but some still migrate seasonally in search of pasture between the lowlands north and west of Andimeshk and the highlands in the north and west of the region. As a result of the compulsory sedentarization policy of the years 1934-1941, these Lor tribes were to some extent fragmented. Parts of a single tribe can now be found living in different districts(Black-Michaud, J., 1974, p. 210-288).

2.3.2 Kurdish tribes

During the century between ca. 1880 and 1980, most of the Kurdish tribes of Iran became sedentary. They have not however lost their ethnic culture or even their affiliations. The Kurdish populated parts of modern Iran lie mainly in the Kermanshah, Kurdistan, West Azerbaijan, Ilam and the north of Khorasan provinces. There are also relatively small communities of Kurds in Kerman, Fars, Varamin, Tehran, the Rudbar district of Gilan pronvice, and elsewhere, even in Baluchistan.

The Kurdish tribal zone stretches into West Azerbaijan. The Bilbas tribe, in three tribes, the Mangur, Piran, and Mamash, are dispersed over the Piranshahr and part of the Mahabad; these groups are in effect sedentary, finding pasturage for their flocks either "vertically" in the mountains or "horizontally" in the plain, but in either case close to their homes.

In the Safavid period certain Kurdish tribes were forced to move to the north of Khorasan, and today there are scattered settlements of Kurds descended from them

between Sarakhs in the northeast of Gorgan. The two principal remaining Kurdish tribes of Khorasan are whose ancestors were likewise forcibly transported, live in the southeast of the Rudbar district in the of Gilzan province (Pur Karim, H., 1969, pip. 23-30; Tawahodi, K., 1980, p. 21-25; Mardukh, M., 1972, p. 36).

2.3.3 Turkish tribes

The Turkish-speaking tribes of Iran are scattered over many regions. Their establishment in the country began with the first incursions of Turkish-speaking peoples and continued in the periods of the Saljuq (1118-1194), Mongol (1256-1335), Timurid (1506-1370), and Safavid (1501-1736) rule. For a variety of reasons, rulers of these dynasties shifted tribes to distant parts of Iran: to employ the tribe for guarding a frontier, to fragment it, to punish it, or to reward and encourage it. One conspicuous example is the dispersal of the Afshar tribe, sections of which are to be found in Khorasan, West Azerbaijan, Khuzestan, Fars, and Kerman provinces.

The principal Turk tribe in Fars is the Qashqai. In the Qajar period, the tribe was administered by its Il-Khani[13] and his deputy and chief executive, the Il-begi, and was apparently not yet organized on the basis of tayefes. Today the tribe is a union of approximately 200 tiras of Turkish, Lori, Kurdish, and Arab origin, but all speaking the same Turkish dialect. There was formerly a large number of tayefes, but today they have been incorporated into six main tayefas, named Darra-shuri, Kashkuli-e Bozorg, Kashkulu-e Kuchek, Farsimadan, Amala, and Sheshboluki. The Qashqai territory starts at Lar and stretches through the southern parts of Fars almost to Behbahan. In spring and early summer, the different tayefes of the tribe traverse distances of between 400 and 500 km to reach their summer quarters. With the exception of a small group whose summer pastures (called the Sarhad-e Kuchek) lie in the eastern part of the Dasht-e Arzhan near Kazerun, the Qashqai tribes-people have their main summer pastures (called the Saraad-e Bozorg) in the area stretching from Eqhlid and Abada westward to the Dena mountain and northward to near shahrreza city in Isfahan province (Bahman Beigi, M., 1945, p. 53).

Three of the tribes which belonged to the Khamsa confederacy in Fars province are Turk. Since the last quarter of the 19th century, they have either become fully sedentary in eastern districts of the province or have been absorbed into other tribes.

The Ilsavan (formerly Shahsavan) tribes in East Azerbaijan are another important Turk group. In Safavid times they belonged to the Qizilbash tribe. Their present territory lies in the north west between Ardabil and the Soviet frontier. The Ilsavans (Shahsavans) around Ardabil are now wholly sedentarized, but some of the tribes around Meshkinshahr still move annually between the foothills of Mount Sabalan and the Moghan Plain.

Among the other Turk tribes of Azerbaijan are those of the Arasbaran(Ahar), with winter quarters in the strip along the Aras river and summer quarters in the Arasbaran mountains and the Ahar-Meshkinshahr highland; and those of the Marand, with winter

[13]More information is in the chapter 2.5.

quarters along the Marand-Bazargan highway and spring and summer quarters in the Meshkinshahr district (Karimzada, M., 1973, p. 81-148).
The Turkmen of Iran live almost entirely in the Golestan province and in the Khorasan province. Their two big tayefas, the Yomut and the Guklan, came to Iran long ago (Irons, W., 1974, p. 635-37).

2.3.4 Arab tribes

From remote times, and particularly after the Arab conquest, right up to the Qajar period, Arab tribes immigrated into Iran. With the passage of time most of the early immigrants merged into the local populations, and today their descendants are scarcely distinguishable from their neighbors. Such are the Arab tribes of Khorasan, including the Bohluli in the Khaf, Bakhuzi in the Bakharz (Tayebad), Khazai at Gusha-ye Khazai, Khavarīi at Qara Zar, Nadi around Birjand and Sarbisha, Abu part east of Sedeh, and the Arabs living in the part of Nehbandan south of Birjand in a locality called the ʿArabkana.
The Arab tribes of Khuzestan, however, have kept their identity better. They are scattered over a zone stretching from the Arvand river (Shat al-ʿArab) and Persian Gulf in the south to Susa and lying roughly to the west of the Bakhtiari tribe territory.
Outside Khuzestan province, the Arab tribe of the Khamse confederacy is an important tribe; it is divided into two sections, Shaybani and Khamse tribes. The Shaybani tribe in the south of Fars province and then to the Eqhlid city district in the north of Fars province, where their summer quarters are flanked on the east by those of the Baseri tribe (Qaem-maqami, J., 1945; Najm-al-molk, A., 1962, p. 74-99).

2.3.5 Baluch tribes

Most of the Baluch tribes of Iran live in the Sistan and Baluchistan province, but Baluch groups have also settled in other provinces: in Hormozgan (Bandar-e ʿAbbas), Kerman, Khorasan and in north of Iran in the Torkman Sahra (the plain between the Gorgan and Atrak rivers).
The Baluch of Khorasan are in general sedentarized and intermixed with the local people, but some distinct communities still remain, scattered from Sarakhs in the northeast to Birjand and Tabas in the south.
Some of the Baluch tribes of Sistan province, migrate annually to the highlands of Nehabandan, and Birjand in Khorasan province.
In the Qajar period, many parts of Baluchistan were ruled de facto by the head of the Naruʾi tribe. When the central government began to establish its authority, the head of tribe moved to the Nikshahr-Bent-Fannuj area in the southwest of the province and kept control there.
The leadership of the tribe was held by three families who still live in the area.
The Rigi tribe, one of the biggest Baluch groups in Iran, has an extensive territory stretching from Zahedan and Mirjava to Khash and onward toward Iranshahr; it is divided into several families, its members are now engaged in stockbreeding.
The Yar Ahmadi (Shahnavazi) and Gamshadzehi tribes were apparently once families of the Damani tribe, but are now more or less independent. Yar Ahmadi tribes-people,

based around Gazv in the Khash district, migrate annually from the west side of the Taftan town, and then to palm groves in the lowland for the date harvest.
Baluch tribes are also to be found in Sistan (Zabol), e.g., the Brahui, Naruʾi, Barani, Mir, and Sarani. The Kurds of Sistan must also be counted among them. As regards the Brahui, the almost unanimous opinion is that they are not Baluch.
According to one report they are from the Mamasani of Fars province. Another view is that they stem from the Kurd people mentioned together with the Baluch by early Islamic geographers. In any case, the tribes of today are too intermingled to be easily identifiable as Brahui or Baluch.
In all probability the Baluch were driven from Kerman into Baluchestan after the penetration of the Saljuq forces into Kerman. Baluch tribes, however, are to be found in Kerman province today: amongst others, the Sarabandi in the Bam, and a section of the Kahnuj, near the Jaz Murian(Spooner, B., 1964, p. 53-57; Spooner, B., 1967; Salzman, P.C., 1971, p. 60-68).

2.3.6 Summary

The number of major tribal groups in the country is 17, namely: Bakhtiari, Qashqai, Ellson (Shahsavan), Mamivand, Boyer Ahmad Sofla, Khamseh, Boyer Ahmad Oliya, Bahmayi, Ghara-daghArasbaran, Mamassani, Kurdish, Tayebi, Jalali, JabalBarezi, Zalki, Baloch and Afshar. In the last few decades, the survey of the status of the nomadic population of Iran indicates a decrease in the proportion of nomadic population compared to the total population of the country. The Nomads Affairs Organization of Iran[14]is arguing this issue.

Table 1: Distribution of nomads in various geographical regions of Iran, Nominee Organization of Iran, Source: http://www.ashayer.ir/index.aspx?siteid=1&pag eid=162

Area	Province	Tribes
West and South	Kurdistan	Goran tribes, Golbaghi, Oramanat, Marivan, Sanandaj, Baneh, Saghez tribes (Kurdish nomads)
	Kermanshah	Kurd Jaaf, Kalhor, Qalkhani, Sangari, Goran and Karand, Salas Babajani, Zanganeh, Zhooleh (Kurdish nomads)
	Ilam	Kurds, Malekshahi, Arkovazi, Shohan, Khozel, Rosgeh
	Lorestan, Ilam	Biranwand, Hassanwand, Papi, Derrickwand, Segund, Zelaki, Maywand
	ChaharmahalvaBakhtiari	Bakhtiari
	Kohgiluyeh&BoirAhammad	Boyerahmad (Oliya, Sofla, Tropical), Bahmayi, Tayyibi, DoshmanZiari, Chram and Baboei (Bavi), Mamasani

[14]Nomads Affairs Organization of Iran is a governmental organization, which is responsible for giving services to the Iranian itinerant mountaineers. With the aim of organizing the migration and voluntary resettlement of nomads, it organizes the necessary policies and plans in coordination with the upstream institutions (government, parliament, Nomads supreme council, etc, source: http://www.ashayer.ir/index.aspx?siteid=1&pag eid=162

	Fars	- Qashqai (tribes) - Khamseh (tribes) includes Arab tribes, Baseri, Baharloo, Inanlou and Nafar - Sorkhi tribe, Mamasani tribe (nomads Lor and Lak)
East and South East	Kerman, Sistan and Baluchestan and Hormozgan	Afshar, JabalBarezi, Bechaghchi, Baluch, Aineh, Soleimani, Qara'i, Asiabor, Khajavi, Borkhori, Poshtkohi,Jazi, Javidan, Raeini, Maboki, Shekari, Shenbou, Ghorba, Kamrani, Kamchi, KomachiSanjari, Kouhshahi , Narmi, Momni, Mohini, LakBakhtiari
North West	East Azarbaijan, West, Ardebil and Guilan	Shahsavan, Arasbaran (GharehPepagh), Khalkhal, Jalali, Milan Khoi, Milan Maku, Shakak, Mamash, Zarza, Pennishin, Piran, Sadat
North East	Khorasan, Semnan, Mazandaran and Golestan	Sangsar, Alikai, Ehsani, Arabs, Afshar (Torkish tribe), Zaferanloo (Kurdish), Shadlou ,Ghachorloo, Teymouri, Hazare, Balouch and Sistani, Turkmen
Central	Zanjan	The tribes of LorChegini and Ghiasvand, the tribe of Turk Shahsawan Baghdadi and the tribe of the Kalhor
	Hamedan	The tribes of Torkashvand, YarmTaghlou, Jimar ,Shahsavan
	Tehran, Qom, Central	Kale Kouhi, Kalhor, Sangsar, Hadavand, Shahsavan Baghdadi, Moghan

The Table 1shows that despite the fact that this process is taking place in Iran, there is still a wide range of nomad populations present in the country. In all provinces in different parts of Iran, we can find some tribes in different cultures. Nowadays however, some of these tribes have been resettled in cities or countryside villages.

The Table 2illustrates the geographical distribution and population of the country's important tribes. Over 2000 Households and their Geographical Distribution and Population in the Country (Nomadic Nomads Census 2008)

Table 2: Population of nomads in various geographical regions of Iran, Nominee Organization of Iran, Source: http://ashayer.ir/index.aspx?fkeyid=&siteid=1&pageid=160

Tribe	Province	Population
Bakhtiari	Chahar Mahal and Bakhtiari, Isfahan and Khuzestan	187777
Qashqai	Fars, Bushehr, part of Isfahan and Chaharmahal va Bakhtiari	112430
Ilsavan (Shahsavan)	East Azarbaijan, Ardebil and Guilan	47248
Mayvand	Lorestan and part of Khuzestan and Hamedan	40087
Boyer Ahmad Sofla	Kohkiluyeh and Boyer Ahmad, part of Fars and Khuzestan	38668
Khamse	Fars, Bushehr, part of Isfahan and Chahar Mahal and Bakhtiari	31715

Gharadagh - Arasbaran	East Azarbaijan	31350
Boyer Ahmad Olia	Kohkiluyeh and Boyer Ahmad, part of Fars and Khuzestan	20396
Bahmei	Kohkiluyeh and Boyer Ahmad, part of Fars and Khuzestan	20286
Mamasani	Fars, Bushehr and part of Kohkiluyeh and Boyer Ahmad	20112
Kurd	Ilam	18478
Tayebi	Kohkiluyeh and Boyer Ahmad	17438
Jalali	West Azerbaijan	15796
Jabal Barezi	Kerman and Hormozgan	13840
Zalaki	Lorestan, part of Khuzestan and Hamedan	13263
Baluch	Sistan and Baluchestan and part of Khorasan	12308
Afshar	Kerman and Hormozgan	12121

2.4 Nomadic economy

The nomads are friends with nature. They respect it since their life depends upon it. It should be mentioned, however, that their way of life is an admirable response to nature and ecology. Many nomads would like to quit this life but they just can't. In past many of them were illiterate, so they could not find any good job. Raising flocks is what they are best at and, since they can't move to the city with their animals, they need to remain with the nomad life. Nowadays some of them are living in villages or cities to have better quality and easy life.

Nevertheless, many peopleare happy with the nomad lifestyle because they are very proud of continuing a tradition which has been going for many generations.(https://againstthecompass.com/en/qashqai-people-iranian-nomads/).

2.4.1 Animal husbandry and agriculture

Traditionally, the nomadic tribes have kept large herds of sheep and goats, which have provided the main source of red meat for Iran. During migrations the tribes trade their live animals, wool, hair, hides, dairy products, and various knotted and woven textiles with. Villagers and townspeople in return trade with manufactured and agricultural goods that the nomads are unable to produce. This economic interdependence between the nomadic and settled populations of Iran has been an important characteristic of the communities for several centuries(http://countrystudies.us/iran/51.htm).

Sheep and goat breeding is the economic mainstay of the tribes of Iran, particularly those not yet sedentarized. They also breed large animals—bovines, buffalos, camels, horses, mules, and donkeys—for ploughing and load-carrying, and in some cases for their milk and hair.

Yet it would be wrong to conclude that the tribal economy rests solely on stockbreeding. Even for wholly nomadic tribes, agriculture, at least of the rain-fed (*deym*) type, has long

been an important resource, and it has become much more so in the recent past. The principal crops sown by the tribes are wheat, barley, and in some cases rice. When conditions permit, they also grow vegetables and plant orchards. Planting date palms is a widespread activity among Arab and Baluch tribes. In addition to stockbreeding and agriculture, annual collection of wild plant and tree products, such as gum *tragacanth*, pine resin, wild almonds, acorns, and a variety of nuts is of considerable importance. In several tribes acorn flour, sometimes mixed with wheat flour, is used to bake a sort of bread.

Employment of tribesmen as labourers on farms and as shepherds within the tribe has long been widespread. Work opportunities for them on development projects and highways building and in cities are recent phenomenon. Canvas weaving, felt making, and construction of canvas or felt tents and brushwood or palm frond huts for use as family homes are important functions performed within the tribe. In a full economic analysis, all the above-mentioned activities should be taken into account.

Nevertheless, the principal occupation of the nomadic tribes is sheep and goat breeding. Their income, wealth, and power all depend on its vicissitudes. Great variations in the number of animals per tribe and per family are found in the different tribal communities.

It is customary among the tribes to keep female lambs and kids for increase of the flock and to sell male lambs and kids when they have been out to graze for one year. Tribesmen who own no animals or for some reason have lost those which they owned can stay in the tribal community and, after working some years as shepherds for others, eventually acquire or reacquire a flock of their own.

The share of the tribes in the whole Iranian livestock sector is thought to be normally about one third or even one half, though no accurate statistics have been taken. The Statistics Center's tribal census of 1994, with its narrow terms of reference, returned figures which are too low. In it the tribes, defined as wholly nomadic, were found to own only 10 percent of the country's 75,000,000 livestock units (1 sheep or goat = 1 unit, 1 donkey = 3 unit, 1 cow or ox = 4 units, etc.), specifically, sheep 11 percent, goats 21 percent, bovines 4 percent, horses 3 percent, mules 9 percent, donkeys 6 percent, and camels 46 percent. There can be no doubt, however, that the numbers of the livestock grazing on natural pastures are far greater than these (www.ashayer.ir/index).

Many tribes, while retaining their tribal structure, have in recent times made agriculture their principal activity. The present circumstances of such tribes will not be discussed here. It has already been noted that agriculture was a significant element in the traditional tribal economy. The "*kuch*" (transhumance) is combined with dry farming in both the"*qeshlagh*" (winter quarters) and the "*yeylaq*" (summer quarters). For example, the Qashqai tribesmen plough land in their qeshlaq in the month of February-March, replough it in the month of March-April before their move to their*yeylaq*, sow the seed in the autumn after their return to the*qeshlaq*, and reap the crop late in March or in early April of the following year, just before their next*kuch*to the*yeylaq*. Early in the autumn they plough and sow in the*yeylaq*before their move to the*qeshlaq*, and they reap the crop in the summer after their return. In the*yeylaq*they sometimes cultivate vegetables as well as cereals (wheat, barley, and a little rice). By leaving half of the

ploughed areas in autumn, they always have land available for sowing and cropping (Peyman, H., 1968, p. 89-90).

In the case of another tribe, the Bala Geriva of Lorestan, which does not make long migrations like those of the Qashqai but has summer and winter quarters only about 90 km or ten days' trek apart, a different rhythm of cultivation and migration has been described. They reap their wheat crop early in the month of June-July, plough and sow in the month of August-September, and then leave the land to itself. In the following year, after their return from the highlands, they again plough and sow wheat as soon as the first rains fall in the month of September-October. They then spend the winter in the*yeylaq*. They set out for their*yeylaq*in the middle of April -March. (Baharvand Amanallahi, S., 1981, p. 47-48).

2.4.2 Nutrition and food products

Nomads use products that they make themselves, including vegetables, dairy and meat of animals they breed in mountains and deserts.

- nomad women find medical herbs and dry them for their families and for sale
- there is a variety of dairy product: milk, yogurts, butter etc.(made by women too)

The animal products supplied by the tribes of Iran are normally lambs and kids for meat, wool, goat hair, ghee, dried whey (*kashk*), and in some cases sheep cheese. The sheep sold for meat are yearling or immature lambs (*shishak*) and, to a less extent, ewes which have become sterile after seven or eight lambings. They even trade their products with the people living in villages and cities in return for commodities they need such as rice, clothes etc.

Fig.28: Kashk is dried in the sun and then used by the family or sold, photo by author

Fig.29: Method of preparation of the butter. Milk is in the skin of sheep and they shake it to separate butter of milk, photo by author

2.4.3 Craftsmanship

Nomadic people engage in handicrafts, particularly carpet making and the weaving of Kilims or (Gelim) and Jajims (smooth and rough woven rugs) and also embroidery, in which the nomad people have a tradition of skill. These manufactures, if sold, augment the incomes of tribal families, though the carpets and kilims are often retained as financial reserves or future dowries for daughters.

The tribal main art is carpet. A variety of carpets displays a scale of colors and motifs. Fabrics made of felt, woven woolen cloths are also very popular. Hide and leather goods finished with decorations also require artisans' hand. In the tents everyday tools and equipment are sometimes richly ornamented.

Fig.30: Gabe, a kind of carpet, . Qashqai Tribe, Fars Province, photo author.

Fig.31: Carpet design of Arkovazi Tribe in Ilam Province, source: http://www.persiancarpetassociation.com/lori_carpet_111.JPG

As already noted, the making of Carpets, *Gelim*s, Gabe, *Jajim*s, and *Khorjin*s (saddlebags) is pursued on a large scale by Iran's tribes. For tribes which themselves produce the requisite wool, these activities were particularly advantageous when the wool price was low. Carpet making in the tribes is done solely by women and girls, who do not use cartoons but know the design by heart. In past times, tribal carpets were made entirely of wool, the warp and weft threads as well as the pile yarn being woolen; but the urban practice of using cotton warps and wefts, or at least cotton warps, took root in certain tribes. The wool requirement for a square meter of carpet averages 3 kg of washed and spun wool, but varies locally and of course depends on the fineness of the knotting. Tribal carpet designs are geometrical, i.e., always have straight lines parallel, vertical, or at a 45° angle to each other, and never have curved lines; this is the main feature distinguishing tribal from urban carpets. A tribal carpet loom is not a vertical frame like the urban daar, but a horizontal brace which can be quite easily fixed, unfixed, and transported (Edwards, A.C., 1953, p.85-89).

2.5 Community/ Society[15] in Nomadic life

2.5.1 Community/ Society

In many cases, nomads have had key roles in war with enemies. Sometimes, they were united as an independent army or an auxiliary force. The history of Iran witnesses many cases of their decisive assistance in defending the country (Baharvand Amanallahi, S., 1981, p. 197).

Social system of Iranian tradition tribes, which applies to the most of the tribes is presented on theFig.27.

In all seven tribal groups analyzed by the author, the hierarchy within communities is similar. The system is based on a family and generations grading. Usually parts of tribes

[15]It is difficult to divide the sense of these two words in description of a tribe. The structure of the group is similar to the structure of the society with their hierarchy and rules.

have blood bonds due to weddings among its members. The social hierarchy is described below:

- Bozorg IL (Big Tribe): consists of few tribes (IL's) and its leader, Head of a Big Tribe, lLkhan, has big influence on social and political situation and relations among tribes in Iran. The Government has contact with tribes through Bozorg IL who organizes inner issues and legal relations between members of a tribe and is also a, representative between the tribe and government. The next in hierarchy is IL (Tribe).
- IL (Tribe) is a part of Bozorg IL. Its "head", who is called *Khan*, has more power than a *Calantar* a head of the next in hierarchy group named Tayefe.
- Tayefe (Clan) is the next, smaller circle within nomadic community. Tayefe consists of *Tire* (Races) and it is managed by *Calantar* (Sheriff). Sheriff's responsibility includes two main fields: establishing law and maintaining discipline among Tayefes, which means also collecting taxes, and is organizing defense of "his" Tayefes from the other Tayefes groups in case of conflicts.
- Tire (Race): every Tire has one nucleus (center) where its people have joint family base. *Kad khoda* or *Alderman* is a head of a Tire and he resolves problems in their small community. Tire kinship is based on a principle of men ancestral lineage andcorrelation of political, social, economic and defensive interests of individual members.
- Olad (Phylum) is just one group of nomads, it has some camps in the fixed locations, its people have influence on important decisions and are bound by community bonds. e.g. if one of them was killed, all people should pay ransom. Elder is head of this group and he is the lowest head in the nomadic system.
- Khanevar (Families): they form basic structure in nomadic community. They are least rich and they form the lowest level in this system.

2.5.2 The Social Structure of Nomadic Societies

As a unit of social life, a tribe has many duties to accomplish. A system is needed to connect a family to the whole tribe. This tribal organization is vital to integrate a tribe from within itself.

One of the subdivisions of a tribe is a "family". The emotional links functioning inside and outside the families are links called "ethnic solidarity", which is much stronger than among settled families.

In nomadic societies, a tribal family with its own definition and functions is distinguished from what we know, nowadays, as a family in modernized societies.Marriage and family formation are very important among the tribes. A tribal family cannot mean anything without a wife and cannot perform its duties. In such a family, the whole family matters, not every individual member. This is the survival code of a tribal family.

"Polygamy" is sometimes seen among tribes. Another wife is another source of assistance the head of a family needs to manage the broadened responsibilities. Of course, this is how it is described by tribal men, but there should be other reasons for this phenomenon too.

Heads of tribes are the wealthiest in tribes. Middle-class people are headmen, elders and similar ranks. The ordinary people are the majority who live hard lives.
Each group has its own different responsibility, property and characteristics. Sometimes, one can say which class they belong to by looking at the size and appearance of their tents(https://www.destinationiran.com/nomads-of-iran.htm).

2.5.3 Tribal population of the country

The number of major tribal groups in the country is 17, namely: Bakhtiari, Qashqai, Ellson (Shahsavan), Mamivand, Boyer Ahmad Sofla, Khamseh, Boyer Ahmad Oliya, Bahmayi, Ghara-daghArasbaran, Mamassani, Kurdish, Tayebi, Jalali, JabalBarezi, Zalki, Baloch and Afshar.
In the last few decades, the survey of the status of the nomadic population of Iran indicates a decrease in the proportion of nomadic population compared to the total population of the country (Nomads Affairs Organization of Iran is a governmental organization Archive No. 156/43/6).

Table 3: Tribal population of Iran, Source: Iranian Nomadic Affairs Organization, 2005, A&B, Iran Statistics Center

Year		Population (Thousands)		Nominal population share of total population (%)
		The whole country	Nomadic	
Historical sources	1867	4400	1700	38/6
	1885	7654	1910	24/9
	1900	9332	2138	22/9
	1924	10000	2000	20
	1940	15090	3100	20/5
	1964	210	2000	9/5
	1967	25789	2500	9/6
Statistical Center of Iran	1975	31951	877	2/7
	1988	49445	1152	2/3
	1999	62432	1304	2/1
	2008	70472.8	1186.4	1.68

2.5.4 Job division in nomadic families

Husband, wife and children are all working and helping the family. Children have their own jobs that depend on their sex. They lead life like adults.(www.destinationiran.com/nomads-of-iran.htm).

2.5.5 Policy of Nomadic life

Political system of Iranian tradition tribes, which applies to the most of the tribes is presented on the chart below:

Fig.32: Diagram of political organization in Nomadic system, source: Baharvand Amanallahi, S., 1981, p.197. 1, 2 Head of tribe, 3 Sheriff, 4 Alderman, 5 Elder, 6 Head of household(translated and designed by author).

The tribal confederations were headed by a paramount leader, or*ilkhan*.Individual tribes within a confederation were headed by a*khan*, *beg*, *shaykh*,or*sardar*.Subtribes, generally consisting of several clans, were headed by*kalantars*.The head of the smallest tribal unit, the clan, was called a*kadkhuda* (http://countrystudies.us/iran/51.htm).

2.6 Clothing

Clothing are the most prominent cultural symbol and the most important manifestation of ethnicity, through which culture is quickly transmitted to others. The design, color, shape of the appearance, details of the garments signify the mood and thought of its owner. Nomadic clothes, which are diverse, special and of course, indigenous in different tribes. Their commitment to preserving their traditional clothes is one of the admirable qualities of this productive and valuable community. women's and men's clothing have a certain originality and identity between nomadic societies. Although over the last 100 years there has been a serious change in the cloths design, it has been less able to affect the form and design of local tribal clothing.

Clothing evolved during the time and now it differs among the tribes. Each of them has own designed according to the needs of community, its culture and beliefs. The dress had always a special place in the culture of Iranian nomads and now there are different clothes for men and women in each ethnic group.

This chapter introduces clothing of different tribes of the country and describes the dress of the male and female of Qashqai tribe in Fars province as one of the largest tribe's in Iran (Table 5). Undoubtedly, Qashqai's dress is one of the most beautiful dresses. In 1997 at the local clothing festival in Tehran, Qashqai dress was the most beautiful dress. Local clothing of Qashqai men and women has some special attractions and today it has become one of the most important cultural attractions of this people.

2.6.1 Qashqai Men's Dress

In the nineteenth century, ordinary men of Qashqai tribe worelooser trouser (Tonban), shirt without collar (Ghinagh), cloak (Arkhalagh) wearing it with a shawl, Woolen jacket[16](kapanak), Black felt hat (Burk). The gun, knife, dagger, sword and the stick were one of the most important parts of men's clothing. While in cities, Qashqai people, especially their supreme officials, wore a dress similar to those of Qajar men's.

At the beginning of the twentieth century, men wore white shirt without collar, Black loose pants that pantlegs was gathered, a loose cloak with a belt closedand felt hat. In winter men wore felted vest and jackets. For celebrations, hunting and warfare, men wore a thin robe called Chogha. The closure of the cartridge line was a taking pride. The men of the Qashqai tribes were recognizable on the basis of the belt and method of closing their cartridge line.

2.6.2 Different parts of Qashqai men's clothing

Hat (Burk) Men must always wear a hat; it is part of their culture. Before the First World War, the Qashqai hats were almost circular,like the Bakhtiari[17] hat. Naser Khan Qashqai[18]gave new hat called (Kolah Do Goosh)[19] hat.

It was made of buff, cream and gray felt's. This hat was quickly accepted by Qashqai men and became a symbol of Qashqai's power, autonomy and identity. The form of this hat looks like a crown. In addition to the beauty and dignity and due to its heavy weight, these hats do not go away with any wind and storm.

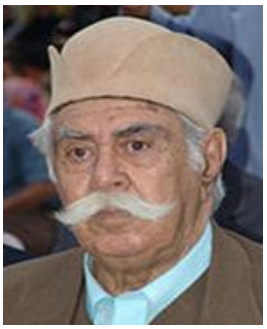


Fig.33: Photo of Naser Khan Qashqai with hat (Kolah Do Goosh). Source:http://ashayer.ir/index.aspx?siteid=1&siteid=1&fkeyid=&siteid=1&pageid=280

Fig.34: Photo of Pahlavi crown and Kolah Do Goosh. Source: http://bayanbox.ir/info/945986881084180548/IMG-20140927-WA0021

- Cloak (Arkhalagh) It is a long dress (robe) that has slash from the sides to the top of the knee. Wearing it with a shawl around the waist. It is possible to

[16]Wool is made into felt - *fulled* rubbed in hot water.

[17]One of the famous tribes in the West of Iran.

[18]One of the best leaders of this tribe.

[19]Kolah means hat, "do" means two and "goosh" means with ear,which means that a hat has two edges.

tuck up the bottom of it, so is not difficult during the running, work and other activity.

- Waist shawl - 5 or 6 meters of brown or white fabric that wraps around the waist. In addition to beauty of their cloths, in addition to beauty, it can keep the spinal column in fast moving and lifting heavy loads while their travel. Also use it as a pocket for keeping money, cigarettes and etc.
- Cheghe - a thin woven overcoat has creamy color and is used to enhant the beauty and the robe.
- Woolen jacket (kapanak) a long felt jacket, that is open in front. Sometimes it has sleeves. It is used in winter.

Fig. 35: Cloak (Arkhalegh), photo Mostafa Karami
Fig. 36: Cheghe, Source: http://ashayer.ir/index.aspx?siteid=1&siteid=1&fkeyid=&siteid=1&pageid=280

Fig.37: Woolen jacket, Source: https://iranantiq.com/handicraft/felt/kapanak-felt-clothing

2.6.3 Qashqai Women's Dress

Women's clothing is provided in a variety of colors, inspired by nature. Women wear multi-layer or loose skirts (Shalite, Tonban), Tonic (Ghinagh) with a slash in both sides and short vest (Arkhalegh). They wear a scarf (Charghad) on their small hats (Kalagheche). Qashqai women never covered their faces. After 1941, the Qashqai women wore the silk forehead (Qalagh), which wrapped around their heads on top of their scarf.

2.6.4 Different parts of Qashqai Women's clothing

- Woman dress (Arkhalegh): this feminine shirt is long and divided into two parts front and back.Its slash makes it easy to walk.
- Loose skirts (Shalite, Tonban) are sewn with light fabric. They are tucked around waist.Two or three layers of skirts prevent them from being blown up by wind exposing naked legs.
- Scarf (Charghad) is a very fine fabric that has a special, colorful design and covers head, but not face.

Table 4: Photos of clothesin different tribes of Iran

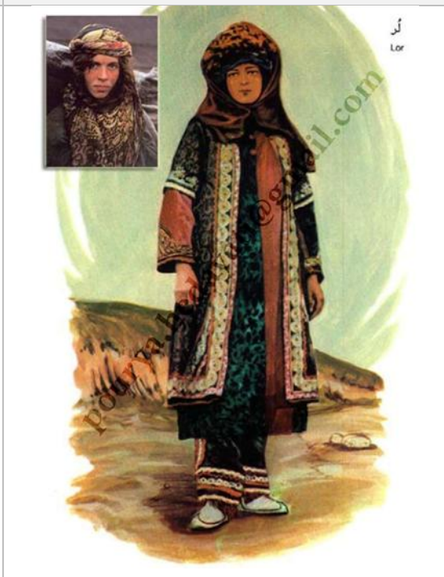
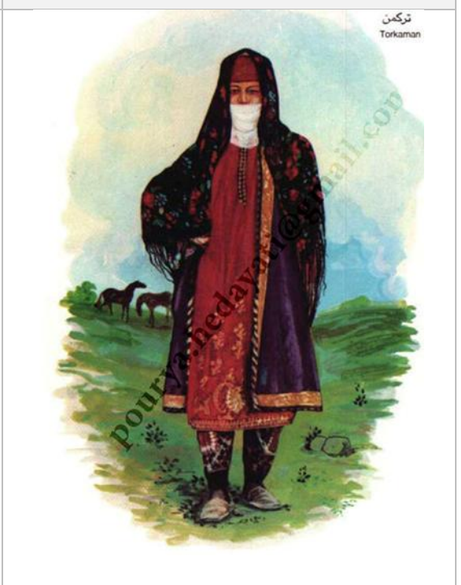
Khorasan	Gilan	Quchan	Qashqai	Mazandaran
				
Abyaneh	**Baloch**	**Bakhtiari**	**Lor**	**Turkmen**
				

Table 5: Photos of clothesin different tribes of Iran



Tribe No. 1: Traditional dress of Qashqai Tribe, Fars Province, photos by author &http://qashqai3da.blogfa.com/post/46&http://www.akairan.com/khanevadeh



Tribe No. 2: Traditional dresses of Tribe Arkovazi. Ilam Province, photo by Mohsen Maalekshahian, source: https://www marde-bakhtiari-bernow.jpg

Tribe No. 3: Traditional dresses of Tribe YaromTatli. Hamedan Province, s
https://www.eligasht.com/Blog/travelguide/%D9%84%D8%A8%D8%A7%


Tribe No.4: Traditional dresses of Tribe Garapapakh. West-Azarbayjan Province, source: http://jamejamonline.ir/online/2600731151112151311


Tribe No. 5: Traditional dresses of Tribe Kormanj. Golestan Province Tribe,
https://flightio.com/blog/travelling-in-iran/khorasan-clothes

2.7 Architecture in nomadic life

2.7.1 House (Black Tent)

Tribes of nomads whose life is based on livestock need to relocate in order to find fodder for their animals. This resulted in mobility and seasonal migration making their life simple enough to live in temporary shelters and with limited number of furnishings, establishing temporary settlements. These sheltershave intricate, versatile design and are created for migrating pattern of living. Inherited from ancestors, their structure was used for many centuries and represents local vernacular architecture and craft. Black Tents have been recognized as a cultural symbol among Iranian people. As there is no physical stabilization connected with the place of living of the tribes, a set of cultural symbols, ideas and beliefs is an anchor for the tribes' identity. The Black Tent is one of them.

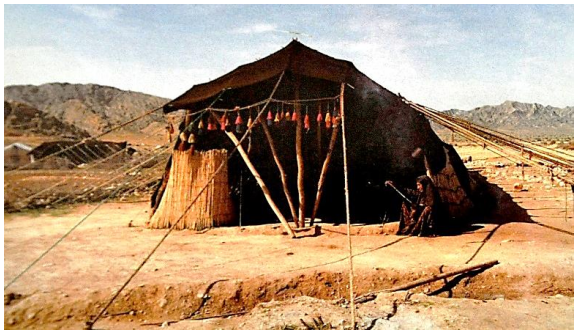


Fig.38: Oashqai tribe's Black Tent in Fars Province, source: Kiani. M., 2006. P.74.

2.7.2 Black Tent and its decorations

Iran has nomadic tribes of different ethnic groups which use different languages (Chapter,2.3). Also, the customs vary from one ethnic group to another. Besides weddings particularly interesting festivities are connected with rituals of death and mourning, celebrations of the New Year, rituals and ceremonies beckoning rain, local sport games and many others.

Decoration in nomadic culture plays an important role: it has always been an element of nomadic tents. Richness and number of decorative elements indicate affluence of a family, in the same way as it is in contemporary town houses.

Decoration of Black Tents is very simple and colourful. It is made of woolen strings and pompons hanging inside and outside Tents. Carpets cover the floor giving colour to the interiors (Hassas, N., 2012, p.71).

Fig. 39: Interior of Black Tent of Qashqai Tribe, photo by author

The most interesting celebration in nomadic life is marriage celebration. Decorations are made with a lot woolen colorful strings and pompons hung inside and outside the tents.

Fig.40: Summer Black Tent of Qashqai Tribe prepared for marriage celebrations, photo by Kiani, source: http://habib101270.mihanblog.com/post/85

Fig.41: Summer Tent decorated for marriage celebrations in Qashqai Tribe, Fars Province, photo by author

Fig.42: Dance in front of a summer Black Tent. Qashqai tribe in Fars Province. Source: http://rangvarehayeyekrang.ir/?p=5236

Fig. 43: Special place in marriage tent, Arkovazi Tribe in Ilam Province, photo. by author

Fig. 44: Inside of wedlock place for a young couple, Tent ofArkovazi Tribe, Ilam Province, photo by author

Fig. 45: Dance in marriage celebration of Kormanj Tribe in Golestan Province. Summer tents in the background, source: http://rangvarehayeyekrang.ir/?p=5236

Fig. 46: Celebration inside the tent. Bahlooli Tribe, Sistan Province. Summer tents in the background. Surce: http://www1.jamejamonline.ir/newstext.aspx?newsnum=100771340688

Customs differbetween the tribes. In Arkovazi Tribe in Ilam Province, they prepare special place separated from the rest of interior of a tent with colourful screens. It is used only for marriage celebrations and a wedding night.
As it can be noticed, arrangement of interiors of Black Tents is very simple and does not change much in celebration time. A lot of activities is performed outside, and inside furnishings are temporarily rearranged. The reason for this is nomadic way of life not allowing to accumulate too much goods. For the same reasons, the decorations are made of wool which is light and re-usable, not adding luggage while the tribe is on the trail. Sizes of tents vary according to financial situation and social level of a family within a tribe. The head of a tribe has the biggest tent, which is sometimes used for the tribe festivities.
Calendar of some of festivities is connected with lunar Arabic calendar, so they have no fixed dates, but the most of them follow solar calendar.

2.7.3 Types of nomadic tents

Black Tent is the main tent in nomadic house but in nomadic life there are other tents that have different usage for nomads.
Umbrella roof tent (Ghalandari Tent)– these tents are colourfull: yellow, green, white and blue and are made of canvas. These tents have two doors that are on the opposite sides of the tent. They are used as schools, guest rooms and bride's rooms. The umbrella tent consists of three parts: a ceiling, a wall with posts and central column.

Fig.47: Ghalandari or Umbrella roof tent view, photo by author

- Column - a wooden pole, 250 to 280 cm in length, with a narrow end and passesthrough the circular plate hole in the middle. After passing through this board, roof becomes vertical. The diameter of this column is about 10 centimeters and is made from wood of trees such as poplar.
- Posts support the wall and the edges of the roof
- Ceiling has a cone shape that placed on the top of the column and the column passes through the hole. The surface of this cone is a circle of twelve pieces of a triangle, and 24 strings of ropes are connected to the triangles, and the other side of ropes are connected to the ground by wooden nails. The junction of the ropes is sewn to the roof with pieces of leather, so that it is not pierced by wind and rain. When the roof is raised by the posts and ropes, it is like a sunshade. Hence its name.

- Wall consists of 12 rectangular pieces of fabric. These fabrics are stitched together and placed between the roof and the ground, like a cylinder around the tent (Kiani. M., 2006, p. 8).

In a nomad school, the lower edges of school tent will be drawn up in the summer to allow fresh air in the classroom.

Fig.48: Inside of the tent, view of roof, photo by author

Fig.49: View of the nomadic school tent, photo by author

Toilet tent is built for the families of tribe's head, because it is time consuming and difficult to dig in a stony soil. For nomads who are constantly moving it does not make sense to to dig a pit and set up a wall. The body of the tent is fixed on short posts, and consists of five pieces of sewn together fabric. Six corner posts are not more than 1.5 meters high. Such tent does not have a roof, but in the winter a kind of umbrella covers it. Its internal area is about 1 m². For faeces/waste a small pit is dug, which is filled with soil on the leave (Kiani. M., 2006, p. 90).

Bathroom tent For nomadic people, who are on the move at least four months a year, full compliance with health and the possibility of using the bathroom is not only difficult, but sometimes impossible. Water shortages in most of the dry areas of the South, lack of shelter, cold weather, shortage of fuel to heat up water are important factors. It can be said that while on the trail the opportunityto have a bath is very low; sometimes cold water must be used. In summer and winter when they settle for a season, each family arranges a simple bath with a stove for warming up water. The bathroom is very simple and consists of threelong wooden posts that form a triangular space on the ground and are bound at the top, forming a tripod. Around it a*jajim*, a kind of rug is fastened. Next to this bathroom, there is a stove.

Fig.50:View of bathroom, source: Kiani, M., 1997, p. 88.

Fig.51:Tripod of bathroom, photo by author

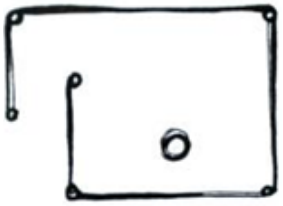


Fig.52:Plan of toilet tent, drawing by author

Pa Sholi- its name is composed of two words: words:*pa* = low part and *sholi*= grout, mud.It is a wall made of grout and stone in front of the tent, sheltering its entrance and sometimes the walls. Itstops cold winds from penetrating into tents and also protects their structure from storms. Pa Sholis are usually made with large stones and grout, forminga simple revetment about one

meter high. The tent is hidden behind it. Although the stone wall is useful as a wind screen, there is a danger from insects, vertebrates and reptiles as they tend to make their homes there too. So, if it is possible, every year Pa Sholis are dismounted and moved a bit andthen rebuilt.

Pa Sholi may be also covered either with a woven tent fabric or with a chaffy, a sort of thatch made of branches. In such case the chaffy roof is mounted on a beam structure supported by wooden poles and covered with branches of trees. The rest of wood is used to make fire (Kiani. M., 2006, p. 92).

Fig. 53: Pa Sholi with a tent roof, source: Filberg. C.G., 1980, p.88.

Fig. 54: Pa Sholi with a tent roof, photo by M. Moghadam

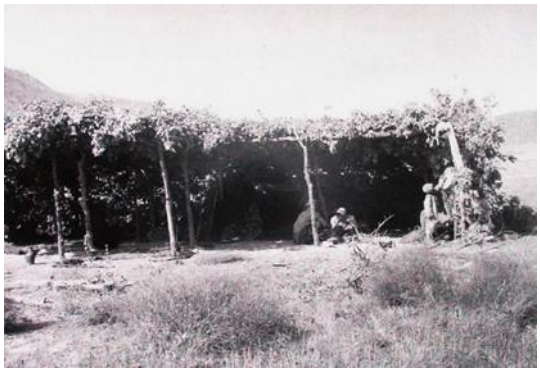


Fig. 55: Pa Sholi with a chaffy roof, source: Filberg. C.G., 1980, p.88.

Fig. 56: Pa Sholi with a chaffy roof, source: Filberg. C.G., 1980, p.88.

3 CHARATERISTICS OF CONTEMPORARY LIVING AREAS AND TRAILS OF CHOSEN IRANIAN NOMAD TRIBES

3.1 Geographical locations and trails

Iran is one of the Southeast Asian countries (Middle East). Its neighbours: Afghanistan and Pakistan to the east, Turkmenistan to the northeast, Caspian Sea in the centre of its northern border, Republic of Azerbaijan and Armeniain the northwest andTurkey and Iraq in the west. Persian Gulf and Oman Sea form the southern border of the country.
As Iran has numerous nomadic tribes in different provinces, author decided to choose seven tribes living in different climates and geograpic situations and with the trails that differ in length and to analyze their Black Tents.

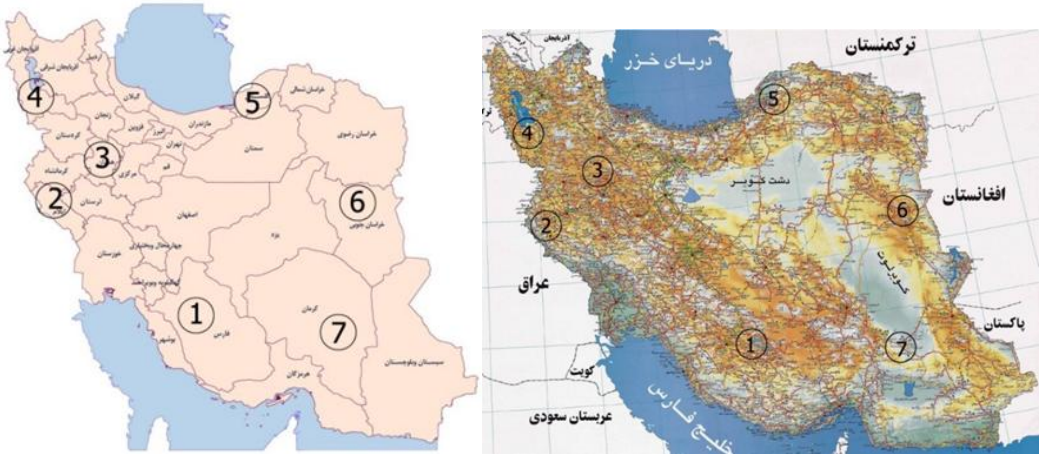


Fig. 57:Locations of the seven tribes surveyed in the research. Administrative division of Iran into provinces, and topographic qualities of the land. Source: Bakhtiari, S, 1984, p. 38

Regions where the analysis of nomad Black Tents was undertaken:

1. Tribe Qashqai in Fars Province – trail 76 km, difference in longitude between summer and winter place
2. Tribe Arkovazi in Ilam Province – trail 76 km, difference in longitude between summer and winter place
3. Tribe YaromTatli in Hamedan Province – trail 350 km, difference in longitude between summer and winter place
4. Tribe Garapapakh in Azarbayjan Province –This tribe dose not immigrant in witer
5. Tribe Kormanj in Golestan Province – trail 176 km, difference in longitude between summer and winter place
6. Tribe Bahlooli in Sistan Province – trail 450 km, difference in longitude between summer and winter place
7. Tribe Soleimani in Kerman Province – trail 418 km, difference in longitude between summer and winter place

3.2 Climatic situation of the discussed areas

Diversified climate of Iran led to development of a variety of forms of architecture throughout the country. This pertains also to the structure of Iranian nomadic homes. Subordination and interaction with the environment and continuous efforts to adapt to the climatic and geographic conditions of every region led to the formation of unique

methods of survival, unique migration systems and exploitation of environmental resources.

This experience is common for peoples in many parts of the world. It has been estimated that between 200-150 million people in the world lead a life centred around shepherd's and cattle breeding. Iran with an average annual rainfall of less than 250 mm, (about one-third of the world's rain) is considered to be part of arid and semi-arid regions. Studies show that traditional sustainable land management and exploitation of such areas isusually cattle-based. Therefore, migrating from cold to tropical regions and vice versa as a model for adapting to the climate change and exploitation of natural resources, is one of the main causes of the development of a nomadic life. It has lasted for several thousand years in Iran (Akbari, A. 2004, p. 8).

To prove that the Black Tents were adapted to the particular qualities of the environments of the seven tribes in their summer and winter locations, it was indispensable to obtain climatic data of the discussed areas.

Access to the climate data and its history was acquired from the website of the State Meteorological Organization of Iran.[20] The matchings with the trails, winter and summer places of residence are presented in the tables with the aim to establishcoincidences between the weather conditions and resistance and sturdiness of the structures of the Tents.

There are fourteen tables showing winter and summer residence conditions for the seven tribes. Blue colour indicates the time when the winter residences are in use and red colour marks the time when the tribes stay in the summer locations. These settlements are sometimes distant, up to 450kilometers, the altitudes of the trails are different too and so are the rainfalls.

Location No.1 refers always to the winter residence of each tribe and location No.2 refers to its summer residence.

There were three climatic parameters taken into account: temperatures (the highest average for summers and the lowest average for winters), precipitation and wind force.

The tables A to C present the State Meteorological Organization surveys (temperature, precipitation and wind force)in summer and winter locations for each tribe respectively. They show occurrences met by the tribes while they live a settled life.

In the tables “A” the temperatures for summer and winter months are given, of which the highest and the lowest values are marked. In the tables “B” extreme (the higest and the lowest) average precipitations are shown, and in the tables “C” the highest and the lowest wind speeds are marked.

The result of this analysis should confirm that the weather conditions chosen by each tribe are optimal for the people and for their herds. The weather conditions encountered by the tribes vary and this fact contributes also to the structures of their tents.

[20]State Meteorological Organization of Iran website http://irimo.ir/far/wd/2703

3.2.1 Qashqai Tribe in Fars Province

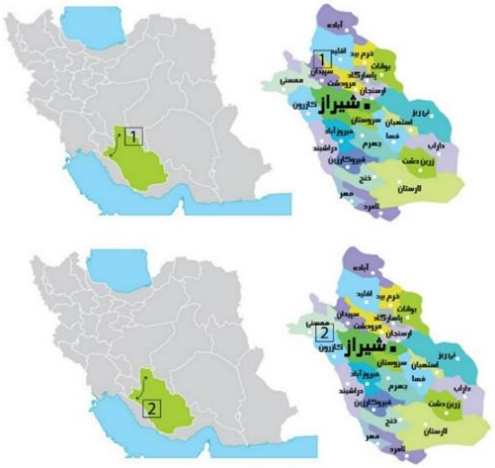


Fig. 58:Fars Province locationin Iran, Qashqai Tribe, No.1 summer residence, No.2 winter residence, by author

Table 6:Qashqai Tribe Location No.1 - summer residence

LATITUDE 3016 N, LONGITUDE 51E, ELEVATION 2240 m a.s.l.
Source of data: Meteorological station: Fars Province, Sepidan

Table 6A: QASHQAI TRIBE, SUMMER, AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	7.2	6.4	12.8	14.1	20.3	26.3	29	26	23.9	19.5	12.2	9.2
2011	3.8	3.1	9	14.8	21.4	26.8	27.5	27.3	23.8	17.4	7.8	6.8
2012	3.7	2.1	6.7	12.9	20.7	24.8	27.5	27	23.2	17.4	10.1	5.7
2013	4.7	7	10.6	12.9	17.8	25.6	29.2	26.4	23.4	17.8	9.8	5.6
2014	2.2	3.4	8.1	15.2	19.8	25.8	27.8	26.9	23.8	17.5	8.4	7.6
Extreme values	2.2	2.1	6.7	15.2	21.4	26.3	**29.0**	27.3	23.9	17.4	7.8	5.6

Table 6B: QASHQAI TRIBE, SUMMER, TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	75.2	136.4	61	24.1	28	7	0	17	0	1	0.9	2.4
2011	183.9	195.2	176.1	32	0	0	0	0	0	2	242.8	4.4
2012	109.6	380.3	121	17.9	3.2	1	0	7.3	0.1	14	166.2	186.8
2013	73.4	70.9	46	74.2	43.9	0	0	4	0	0	139	28.4
2014	219	134.8	86	60.4	2.2	0.1	0.2	3.7	0	5	111.9	8.4
Extreme values	183.9	380.3	176.1	**74.2**	43.9	1.0	0.2	17.0	0.1	14.0	242.8	186.8

Table 6C: QASHQAI TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	1.6	2.2	2.5	2.7	2.8	3.1	2.9	3.1	2.5	2.2	1.7	1.7
2011	1.6	1.2	2.3	2.9	3.2	3.3	3.6	2.9	2.8	2.9	2.2	2.1
2012	2.2	2.4	2.9	2.7	3.6	3.4	3.4	2.7	2.4	2.3	1.7	1.7
2013	2.4	2	2.7	3.6	3.2	2.9	3	3.1	3.1	2.7	1.9	2.3
2014	1	2.6	2.5	3.2	3.5	3.2	3.3	3.5	2.9	2.9	2	1.9
Extreme values	2.4	2.6	2.9	**3.6**	**3.6**	3.4	**3.6**	3.5	3.1	2.9	2.2	2.3

Top average conditions for Qashqai Tribe in summers are as follows: highest average temperature 29.0°C, highest average precipitation 74.2 mm, highest average wind speed 3.6 m/s.

Table 7:Qashqai Tribe Location No.2 - winter residence

LATITUDE .3007 N, LONGITUDE51.32E, ELEVATION 970.4 m a.s.l.
Source of data: Meteorological station: Fars Province, Noor Abad

Table 7A: QASHQAI TRIBE, WINTER, AVERAGE OF MONTHLY TEMPERATURE [°C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	12.2	13.3	18.7	21.6	28.4	34.5	36.6	34.6	31.6	26.3	18.2	14
2011	11.1	11.4	15.6	22	29.6	34.3	36	34.8	30.7	24.1	15.2	12.2
2012	10.3	10.6	14.2	20	28.9	33.4	36	34.5	29.9	24.6	17.4	11.9
2013	11.1	13.6	17.4	21.2	26.5	32.8	36	33.3	29.8	23.8	16.5	11.8
2014	9.8	11.6	16	22.5	28.3	33.1	35.1	33.4	30	24.7	15.4	13
Extreme values	**9.8**	10.6	14.2	22.5	29.6	34.5	36.6	34.8	31.6	23.8	15.2	11.8

Table 7B: QASHQAI TRIBE, WINTER, TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	65.5	65	24	19	34.5	0	4	3	0	0	2	3
2011	146.7	126.2	103	8.1	0	0	0	0	0	2	246.3	0
2012	65.8	189	46.9	23.7	1	0.1	0	0	0	20	160.3	171
2013	62.5	32	25	31.6	54.7	0	0	0	0	0	119.3	20
2014	188.5	49	62	25	1	0	17	10.1	0	2.7	89.8	8.2
Extreme values	188.5	189.0	103.0	31.6	54.7	0.1	17.0	10.1	0	20.0	**246.3**	171.0

Table 7C: QASHQAI TRIBE, WINTER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	0.5	0.7	0.9	1.1	1.5	1.5	1.7	2.1	1.5	1	0.7	0.4
2011	0.8	0.9	0.8	1.5	1.6	1.2	1.9	1.5	1.1	1.2	0.9	0.3
2012	0.6	1	1.5	0.9	1.8	1.5	2.1	1.6	1.2	0.9	0.6	0.6
2013	0.8	0.5	1.1	1.7	1.4	1.1	1.3	1.1	0.7	1	0.5	0.5
2014	0.5	1.1	1.3	1	1.6	1.5	1.6	1.9	1.1	1.4	1.1	0.3
Extreme values	0.8	1.1	1.3	1.7	1.8	1.5	2.1	2.1	1.5	**1.4**	1.1	0.6

Top average conditions for Qashqai Tribe in winter are as follows: lowest average temperature +9.8°C, highest average precipitation 246.3 mm, highest average wind speed 1.4 m/s.

Qashqai Tribe - recapitulation

The Qashqai Tribe, by moving from the latitude 2240 m a.s.l. in summer, to 970 m a.s.l. in winter avoids summer extreme temperatures. They experience top average valued as 29.0°C in lowlands instead of 36.6°C in highlands in the same time. Highland summer pastures are dryer in winter than the pastures in the lowlands, as the rainfall there is about 54.7 mm, in comparison with 74.2 mm, in the lowlands where they spend winters. Wind force in the summer upland pastures is not high 3.6 m/s, but advantageous in high temperatures.

In winter Qashqai Tribe location is noted for the lowest temperatures near 9.8°C, while in their summer pastures it drops to 2.1°C in that time. Similarly, staying in a lower location they experience the top average rainfall 246.3 mm, while the rainfall in the mountains is reported to be as high as 380.3 mm. Wind top average values in winters are lower than in summers, and average to 2.1m/s in top average interval.

In general, the Black Tents of Qashqai Tribe do not undergo large strain from wind, if there are no extreme weather occurrences. Heavy rainfalls happen in winters.

3.2.2 Arkovazi Tribe in Ilam Province

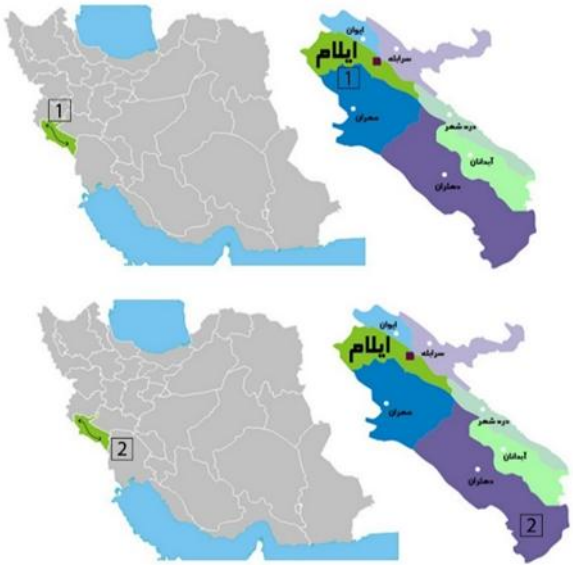


Fig. 59:Ilam Province locationin Iran, Arkovazi Tribe. No.1 summer residence, No.2 winter residence, by author

Table 8:Arkovazi Tribe. Location No.1 - summer residence

LATITUDE 33 38 N, LONGITUDE 46 26 E, ELEVATION 1337.0 m a.s.l.
Source of data: Meteorological station: Ilam Province, Ilam

Table 8A: ARKOVAZI TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	7.1	7	12.3	14.5	20.1	27.4	30.4	29.4	26.2	20.3	12.6	8.4
2011	4.1	4.6	9.1	14.6	20.1	26.7	29.7	28.7	24.1	16.8	7.7	5.9
2012	3.3	4.7	6.7	15.5	21.6	27.4	29.7	29.1	24.5	19.2	11.5	6.7
2013	4.6	7.8	11.4	15.7	18.9	26	29.5	27.9	23.7	16.9	11.1	5.2
2014	4.8	5.9	10.4	15.5	21.7	26.5	29.6	29.5	24.6	17.3	9.4	7.9
Extreme values	3.3	4.6	6.7	15.7	21.7	27.4	**30.4**	29.5	26.2	16.8	7.7	5.2

Table 8B: ARKOVAZI TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	65.3	117	60.2	84.7	60.1	0	0	5.7	0	0.2	2	59.6
2011	157	48.3	58.5	72.6	36.9	0	0	0	0	40.7	5.8	8.6
2012	35.7	55.2	115.1	42.3	7.8	0	0	0	0	13.5	119.6	68.8
2013	146.1	31.3	0.7	7.4	52.9	0	0	0	0	2.8	162.1	126.8
2014	138.6	65.7	106.6	34.5	0.8	0	0	18.4	0	77.9	91	19.8

Table 8C: ARKOVAZI TRIBE, SUMMER,AVERAGE OF MONTHLY WIND SPEED (m/s)

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	2.9	2.6	2.8	2.5	2.6	3.2	3.4	2.9	2.8	2.6	2.3	2.7
2011	2.2	2.5	2.9	3.2	2.9	3.4	3.2	3.4	3	2.6	2.3	2.4
2012	2.6	3.2	3.1	2.8	3	3.5	3.4	3.6	2.9	2.6	2.2	2.4
2013	2.7	2.7	3	3	3.2	3.5	3.2	3	2.9	2.5	2.1	2.4
2014	2.1	2.5	2.6	2.5	2.7	3.4	3.2	3	2.8	2.5	2.3	2.1
Extreme values	2.9	3.2	3.1	3.2	3.2	3.5	3.4	**3.6**	3.0	2.6	2.3	2.7

Top average conditions for Arkovazi Tribe in their summer pastures are: temperature 30.4°C, precipitation 84.7 mm and wind speed 3.6 m/s.

Table 9:Arkovazi Tribe. Location No.2. – winter residence

LATITUDE 33 06 N, LONGITUDE 46 09 E, ELEVATION 1336.0 m a.s.l.
Source of data: Meteorological station: Ilam Province, Mehran

Table 9A: ARKOVAZI TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [°C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	14.2	15.5	20.9	24.6	31	37.4	39.7	39.9	35.4	29.2	20.4	14.5
2011	11.2	12.8	18	24.1	30.8	36.4	39.2	38.3	33.5	25.6	15.6	11.4
2012	11.1	12.7	15.9	25.7	32.7	37.1	40.1	38.3	33.8	28.6	19.3	13.6
2013	11.5	15.2	19.9	25.2	27.7	34.9	38.1	36.8	33	25	18.9	11.2
2014	11.3	13	18.6	24.9	32.2	36.3	38.3	38.9	34	26.3	16.8	14.6
Extreme values	**11.1**	12.7	15.9	25.7	32.7	37.4	40.1	39.9	35.4	25.0	15.6	11.2

Table 9B: ARKOVAZI TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	11.4	49.4	8.2	37.5	13.5	0	0	0	0	2	4.4	17
2011	80.5	14.1	15.5	29.5	24	0	0	0	0	8	0.4	0.2
2012	3.4	5.3	15.7	26	1	0	0	0	0	5	48.2	72
2013	61	13	0	0	17.4	0	0	0	0	0	61.5	31.4
2014	95	23.6	50.8	17	0	0	0	0	0	21.3	47.3	1.2
Extreme values	**80.5**	49.4	50.8	37.5	17.4	0	0	0	0	21.3	61.5	72.0

Table. 9C: ARKOVAZI TRIBE, SUMMER,AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	4.2	2.9	3.6	3.6	4.4	4.6	4.8	2.6	3	3	1.9	1.9
2011	1.9	2.3	3.6	3.5	3.8	5.2	4.6	4.5	3.7	2.8	2.3	2.2
2012	2.6	2.9	3.5	3.4	3.9	5.3	4.7	5.7	4.1	3.1	2.3	2.3
2013	3	3.5	4.2	3.2	3.6	5.6	6.1	4.1	3.4	2.8	2.1	2.9
2014	2	2.6	3.1	3.2	3.8	5.6	5.5	4.3	4.2	3.8	2.8	2.4
Extreme values	**4.2**	3.5	**4.2**	3.6	4.4	5.6	6.1	5.7	4.2	3.8	2.8	2.9

Top average conditions for Arkovazi Tribe in winter are as follows: lowest average temperature +11.1 °C, highest average precipitation 80.5 mm, highest average wind speed in winter is 4.2 m/s.

Arkovazi Tribe - recapitulation

Although Arkovazi Tribe does not change latitude of their pastures, local climatic conditions allow them to avoid extreme precipitation in winter and extreme heat and drought in summer. In summer, they encounter top average temperatures around 30.4°C, while in the area of their winter stay, top average temperature is 40,1°C. Precipitation in summer is up to 84.7 mm, while at the same time their winter pastures suffer period of drought with average four months of 0 mm rainfall. Wind speed in their summer residences is around 3.6 m/s as the top average value, while in the area of their winter stay, at the same time the winds are twice as strong 6.1 m/s.

Alternatively, in winters, as Arkovazi Tribe seeks warmer place, and they settle in the area where winter lowest temperature is 11.1°C. It is much warmer than in the places where they stay in summers, with 3.3°C as top average temperatures. The decision of changing the pastures proves similarly good when precipitation is concerned, which amounts to 80.5 mm in their winter place, and with similar rainfall in neighbouring months. At the same time the summer location would have up to 162.1 mm top average rainfall. The top average values of speed of wind are around 4.2 m/s, while in summer location it is slightly lower, and amounts to 3.2 m/s.

In general, the Black Tents of Arkovazi Tribe do not undergo large strain from wind, it is rather rain that endangers their performance.

3.2.3 Tribe YaromTatli in Hamedan Province

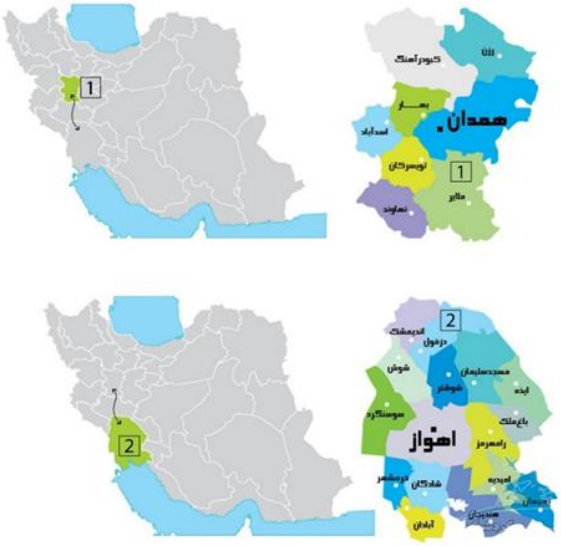


Fig. 60:Hamedan Province locationin Iran,YaromTatli Tribe, No.1 summer resident, No.2 winter resident, by author

Table 10:Yarom Tatli Tribe Location No.1 - summer residence

LATITUDE 34 25 N, LONGITUDE 48 86 E, ELEVATION 1776 m a.s.l.
Source of data: Meteorological station: Hamedan Province, Malayer

TABLE 10A: YAROM TATLI TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	5	4.2	10.7	12.9	17.1	24	28	25.3	22.1	16.7	7.9	4.6
2011	0.3	2.4	5.8	12.6	16.9	23.6	27	25.9	21.2	14.1	5.3	2.9
2012	1.3	1.6	4.9	12.2	18.2	23.5	26	26.8	21.7	14.8	8.2	3.2
2013	1.8	5.1	9.1	12.4	16.1	23.3	27.9	25.9	21.3	14.6	8.3	1.3
2014	-0.6	1.1	8	12.9	17.8	23.8	27.8	26.8	22.3	14.3	5.9	4.3
Extreme values	5	5.1	10.7	12.9	18.2	23.8	28	**26.8**	22.3	16.7	8.3	4.6

Table 10B: YAROM TATLI TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	20.4	59.9	45.7	93.1	24.4	0	0	19	0.2	0	12.2	28.9
2011	42.2	17.6	11.1	33.1	82.7	4	0	0	1	47.5	65.4	1.8
2012	10.6	25.8	18.2	85.3	13.3	0	8.1	0	0	52.2	36.5	36.9
2013	30.2	22.4	28.4	52.4	53.8	3.4	0	0	0	7	48.6	79.7
2014	34.9	19.9	63.3	50	17.9	1.2	0	0	0	60.5	44	14.4
Extreme values	42.2	59.9	63.3	**93.1**	82.7	4	8.1	19	1	60.5	65.4	79.7

TABLE 10C: YAROM TATLI TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	4.7	4.2	5.1	4.3	4	3.5	3.6	3.4	3	3.4	3.1	3.3
2011	3.2	3.8	3.6	5.1	4	3.3	3.4	3.1	2.8	3.1	2.7	3
2012	3.7	3.7	4.6	3.1	3.8	3.2	3.4	3	2.9	2.8	2.4	2.9
2013	3.7	3.8	4.8	3.5	3.4	2.7	2.5	2.8	2.7	3.1	2.8	2.8
2014	2.4	2.8	4.1	3.4	3.4	3.1	3.2	3.2	2.7	3	2.5	2.7
Extreme values	4.7	4.2	5.1	**5.1**	4	3.5	3.6	3.4	3	3.4	3.1	3.3

Top average conditions for Yarom Tatli Tribe in their summer pastures are: temperature 26.8°C, precipitation 93.1 mm and wind speed 5.1 m/s.

Table 11: Yarom Tatli Tribe Location No.2. - Winter residence

LATITUDE 32 40 N, LONGITUDE 48 38 E, ELEVATION 143.0 m a.s.l.
Source of data: Meteorological station: Khoozestan Province, Dezfool

TABLE 11A: YAROM TATLI TRIBE, WINTER, AVERAGE OF MONTHLY TEMPERATURE [oC]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	13.2	15.1	19.9	24.7	30.7	37.3	38.7	37.7	33.3	27.7	19	13.5
2011	12	12.9	17.3	23.9	31.5	36	37.8	36.2	31.3	24.9	15.7	10.9
2012	10.8	12.5	16.2	24.1	32	36.5	38.7	37.1	31.3	26.4	19	13.4
2013	11.7	14.4	18.7	24	28.5	35.1	36.9	34.5	30.9	23.1	18.3	11.6
2014	12.6	-	-	-	-	-	-	-	-	-	-	-
Extreme values	**13.2**	15.1	19.9	24.7	30.7	37.3	38.8	37.7	33.3	27.7	19	13.5

Table 11B: YAROM TATLI TRIBE, WINTER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	10	27.5	4.1	44.9	43	0	0	0.1	0	0	9	29.7
2011	119.2	37.2	37	10.1	6.1	0	0	0	0	0	60.7	0.1
2012	12.1	58.3	7.1	8.5	2.4	0	0	0	0	13.6	87.7	107.9
2013	114.9	5.4	5.7	2	121.8	0	0	0	0	0.1	41.4	64.1
2014	4	-	-	-	-	-	-	-	-	-	-	-
Extreme values	**119.2**	58.3	37	44.9	121.8	0	0	0.1	0	13.6	87.7	107.9

Table 11C: YAROM TATLI TRIBE, WINTER,AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	0.5	0.8	0.8	1.2	1.4	1.8	1	1	0.8	0.8	0.5	0.6
2011	0.6	0.9	1	1.6	1.7	0.9	0.7	0.5	0.4	0.8	0.7	0.1
2012	0.6	1.3	1.6	1.4	1.7	1.1	1.1	1	0.6	0.7	0.6	0.7
2013	0.9	0.8	1	1.3	2.4	1.7	0.9	0.7	0.9	0.5	0.7	0.8
2014	3	-	-	-	-	-	-	-	-	-	-	-
Extreme values	3	1.3	**1.6**	1.6	2.4	1.8	1.1	1	0.9	0.8	0.7	0.8

Top average conditions for Yarom Tatli Tribe in winter are as follows: lowest average temperature 13.2°C, highest average precipitation 119.2 mm, highest average wind speed in winter is 1.6 m/s.

Yarom Tatli Tribe - recapitulation

The Yarom Tatli Tribe, by moving from the latitude 1776 m a.s.l. in summer, to 143.0 m a.s.l. In winter avoids summer extreme temperatures. They experience top average valued as 26.8°C in lowlands instead of 38.8°C in highlands. Highland summer pastures are dryer in winter than it the pastures in the lowlands, as the rainfall there is about 93.3 mm, in comparison with 121.8 mm, in the lowlands where they spend winters. Wind force in the summer upland pastures is not high, average 5.1 m/s, which is advantageous in high temperatures.
They move for winter resident to south west of Iran to Khoosestan province. This province is on the same level as the Persian Gulf and has extremly warm weather in summer. In winter location is noted for the lowest temperatures near 13.2°C, while in their summer pastures it drops to 4.6°C in that season. They experience the top average rainfall 79.7 mm in a lower location, while the rainfall in the mountains is reported to be as high as 119.2 mm. Wind top average values in winters are lower than in summers, and average to 1.6 m/s in top average interval.

In general, the tents of Yarom Tatli Tribe does not undergo large strain from wind, if there are no really extreme weather occurrences. Heavy rainfalls happen in winters.

3.2.4 Tribe Garapapakh in West-Azerbaijan Province

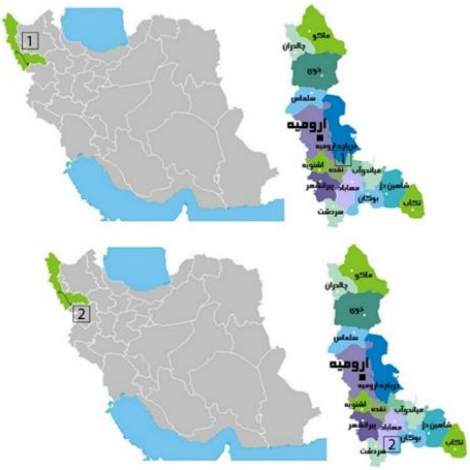


Fig. 61: West-Azerbaijan Province locationin Iran,Garapapakh Tribe, No.1 summer resident, No.2 winter resident, by author

Table 12: Garapapakh Tribe Location No.1 - Summer residence

LATITUDE 36 95 N, LONGITUDE 45 41 E, ELEVATION 1307.0 m a.s.l.
Source of data: Meteorological station: West Azerbaijan Province, Nahade

Table 12A: GARAPAPAKH TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	5.8	6.3	10.8	13.5	18.7	25.7	27.9	26.8	24.6	18.5	9.9	5.3
2011	-1.8	3.8	7.4	13.7	18.5	24.7	27.8	26.1	22	15.2	3.1	0.6
2012	2.3	2	5	15.5	20.7	24.9	26.8	28.3	22.7	16.5	10	3.9
2013	2.2	6.2	10	15	17.9	24.2	27.1	25.6	23.4	14.6	10.2	-4.1
2014	0.2	2.9	10.2	15.5	20.4	24.8	27.6	28.1	24.2	14	6.7	4.3
Extreme values	5.8	6.3	10.8	15.5	20.7	25.7	27.9	**28.3**	24.6	18.5	10.2	5.3

Table 12B: GARAPAPAKH TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	11.9	27.8	67.9	59.8	36.1	7.3	0	1	2	8.9	0	6.4
2011	43.5	30.1	77	99.9	28.5	0.1	0.9	0.4	1.6	37.5	48	8.3
2012	18.7	11.2	25.8	43.5	45.4	3.3	0.5	0	6	32.7	86.8	57.4
2013	62.3	22.7	23.3	21.4	64.3	0.2	0	0	0	1.6	76.8	67
2014	24.4	5.5	66.3	29	33.6	1.5	28.2	0.8	3	169.4	33.1	35.4
Extreme values	62.3	30.1	77	**99.9**	64.3	7.3	28.2	1	6	169.4	86.8	57.4

Table 12C: GARAPAPAKH TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3	2.3	4.7	3.3	3.2	3	3	2.1	2.8	3.4	1	2
2011	1.5	4.9	3.9	5.5	3.9	3.4	1.4	2	1.6	2.6	1.8	1.3
2012	2.8	4.5	5.3	4	3.9	3.1	2.4	1.9	2	1.9	1.4	2.7
2013	3.6	3.2	6.1	3.9	2.7	2.4	2.4	2.1	2.8	3.1	2.1	1.9
2014	1.8	3	4.3	4.5	3	3.6	3.1	2.3	3.2	2.1	1.8	1.6
Extreme values	3.6	4.9	6.1	**5.5**	3.9	3.6	3.1	2.3	3.2	3.4	2.1	1.9

There is no climatic data for Garapapakh Tribe winter residence, as due to very low temperatures in winter in the area of their winter stay, the tribe has permanent houses. They do not pitch the tents in winter, but return to their built homes, which they leave in spring.
Their trail is typically a vertical one.

Garapapakh Tribe - recapitulation

Top average conditions for Garapapakh Tribe in their summer pastures are: temperature 28.3°C, precipitation 99.9 mm and wind speed 5.5 m/s. In general, the tents of Garapapakh Tribe do not undergo large strain from wind and rain. And they are not used in winter.

3.2.5 Tribe Kormanj in Golestan Province

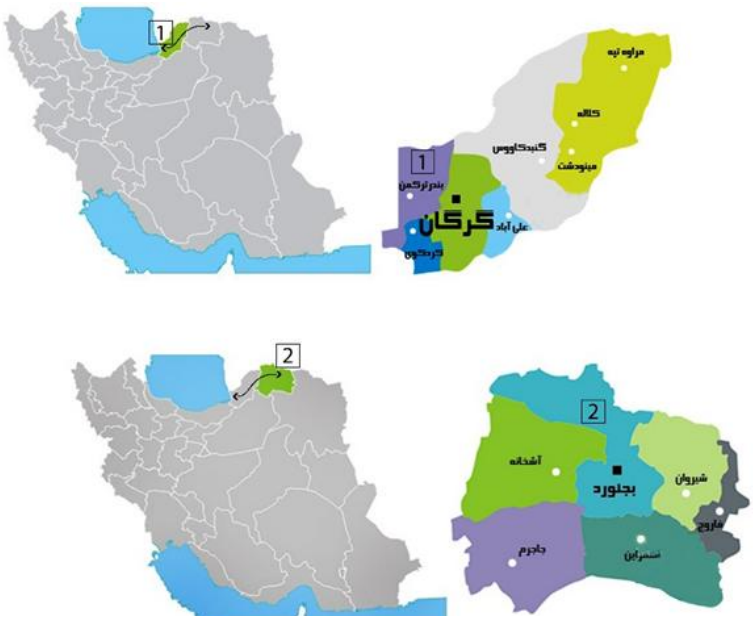


Fig. 62:Golestan Province locationin Iran,Kormanj Tribe, No.1 summer resident, No.2 winter resident, by author

Table 13: Kormanj Tribe Location No.1 - Summer residence

LATITUDE 37 80 N, LONGITUDE 55 94 E, ELEVATION 460 m a.s.l.
Source of data: Meteorological station: Golestan Province, Marave Tape

Table 13A: KORMANJ TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	9.6	8	12.3	14.3	21.3	29.7	30.4	29.5	25	21.1	14.7	12.5
2011	7.6	5.9	9	16.7	21.5	26.5	30.3	27.4	23.7	17.1	7.5	7.4
2012	6.2	4.1	9.1	18	23.8	27.2	27.8	29.9	24.1	20.6	13.5	9.4
2013	9.5	9	13.1	15.3	21.4	26.2	28	26.8	26.1	18	14.3	6.5
2014	7.4	5.2	11.3	17	24.9	27.7	29.1	30.6	26.3	17.2	11	9.8
Extreme values	9.6	9	13.1	18	23.8	29.7	30.4	**30.6**	26.3	21.1	14.7	12.5

Table 13B: KORMANJ TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	34.5	73.9	28.8	49.7	33.4	8	0	0	45	16.1	5	1.3
2011	39.5	75.4	57.6	23.1	25.1	21.5	2	55.6	20	52	25	24.7
2012	33	52.2	84.4	67.1	67	40.1	91.8	10.3	17.7	40.8	36.7	48.1
2013	40.1	56.4	36	54.7	28.8	0.2	0.9	1.3	2.6	34.3	14.3	64.4
2014	18.7	14.1	78.3	43.5	8.2	21.8	0.4	43	1.2	23.4	49.4	29.8
Extreme values	40.1	75.4	84.4	67.1	67	40.1	**91.8**	55.6	45	40.8	52	64.4

Table 13C: KORMANJ TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3.6	3.9	3.4	3.6	3.7	4.2	4.5	4.4	3.9	3.5	3.1	3.8
2011	3.8	3.4	3.1	3.4	3.4	3.9	4	3.5	3.5	3.3	2.2	3.7
2012	4.2	4.8	4.3	3.6	3.9	4.3	4	3.9	3.9	3.2	2.6	4.1
2013	5.9	3.8	4.3	3.1	4.1	4.3	4.7	4.1	3.7	3.4	2.5	3.3
2014	3.6	3.4	3.4	2.9	3.6	3.7	3.7	3.4	3.1	2.8	2.7	3.2
Extreme values	5.9	4.8	4.3	3.6	4.1	4.3	**4.7**	4.4	3.9	3.5	3.1	4.1

Top average conditions for Kormanj Tribe in their summer pastures are: temperature 30.6^{o}C, precipitation 91.8 mm and wind speed 4.7 m/s.

Table 14: Kormanj Tribe Location No.2. - Winter residence

LATITUDE 37 48 N, LONGITUDE 57 39 E, ELEVATION 1049 m a.s.l.
Source of data: Meteorological station: North_Khorasan Province, Bojnoord (the station was established in May 2018)

Table 14A: KORMANJ TRIBE, WINTER,AVERAGE OF MONTHLY TEMPERATURE [°C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2018	-	-	-	-	20.3	23.6	34.6	22.7	20.8	13.1	7.1	4.5
2019	3.4	2.2	6.7	11.6	18.4	-	-	-	-	-	-	-
Extreme values	3.4	**2.2**	6.7	11.6	20.3	23.6	34.6	22.7	20.8	13.1	7.1	4.5

Table 14B: KORMANJ TRIBE, WINTER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2018	-	-	-	-	0	0	0	0	0.2	16.1	16	21
2019	53.6	49	111.6	39.7	18.5	-	-	-	-	-	-	-
Extreme values	53.6	49	**111.6**	39.7	18.5	0	0	0	0.2	16.1	16	21

Table 14C: KORMANJ TRIBE, WINTER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2018	-	-	-	-	0.5	2	2	2.1	1.6	1.1	0.7	0.5
2019	0.7	0.8	1.1	1.2	1.1	-	-	-	-	-	-	-
Extreme values	0.7	0.8	**1.1**	1.2	1.1	2	2	2.1	1.6	**1.1**	0.7	0.5

Top average conditions for Kormanj Tribe in winter are as follows: lowest average temperature 2.2°C, highest average precipitation 111.6 mm, highest average wind speed in winter is 1.1 m/s.

Kormanj Tribe - recapitulation

Kormanj Tribe does not change latitude of their pastures, local climatic conditions allow them to avoid extreme precipitation in winter and extreme heat and drought in summer. In summertop average temperatures are around 30.6°C, while in the area of their winter stay top average temperature is 34.6°C. Precipitation in summer is up to 91.8 mm, while at the same time their winter pastures suffer period of drought with four months of average 39.7 mm rainfall. Wind speed in their summer residences is around 4.7 m/sthe top average value, while in the area of their winter stay, at the same time the winds are half of it - 2.1 m/s. In hot weather higher wind makes it more bearable.

Alternatively, in winters, as Kormanj Tribe seeks warmer place, and they settle in the area where winter highest average temperature is 13.1°C. It is not much warmer than in theirsummer encampment with 21.3°C as top average. The decision of changingthe pastures is good when precipitation is concerned. It amounts to 111.6 mm in their winter place, while the summer location has only 84.4 mm top average rainfall. In the case of wind, the top average speed values are around 1.1 m/s, while in summer location it is higher and amounts to 5.9 m/s., which in low (13.1°C) would be less comfortable

3.2.6 Tribe Bahlooli in Sistan Province

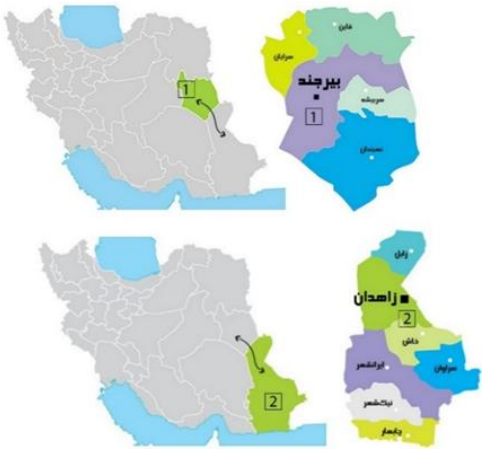


Fig. 63: Sistan & Baluchestan – South.Khorasan Provinces locationin Iran, Bahlooli Tribe, No.1 summer resident, No. 2 winter resident, by author

Table 15: Bahlooli Tribe Location No.1 - Summer residence

LATITUDE 32 89 N, LONGITUDE 59 28 E, ELEVATION 1491.0 m a.s.l.
Source of data: Meteorological station: South_khorasan Province, Birjand

Table 15A: BAHLOOLI TRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	6.5	8	14.9	19.1	23.8	27.7	28.9	25.7	21	19.3	9.4	4.6
2011	4	6	11.6	18.9	25.2	28.8	27.3	27.6	22.1	17.3	11.4	2.9
2012	2.9	3.4	10.4	17.4	23.2	24.9	28	25.7	21.3	15.8	10.5	5.6
2013	4.8	6.9	13.3	16.7	22.8	28.9	29	26.6	24.6	18.5	10.6	4.9
2014	4	3.4	11	18.7	22.1	27.7	28.2	26.4	24.4	17.8	8.8	5.1
Extreme values	6.5	8	14.9	19.1	25.2	**28.9**	**28.9**	27.6	24.6	19.3	11.4	5.6

Table 15B. BAHLOOLI TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	32	42.6	28.2	9.9	13.3	0.2	0	0	0	0	0	0
2011	8.5	36.4	13.3	5.4	6.6	1	0	0	0	0	12.5	2.8
2012	7.3	56.9	6.6	22.6	2.7	0.7	0	0	0	5.2	15.5	44.3
2013	12.2	37.5	24.3	18.9	0.2	0.1	0	12	0	0.1	19	3.1
2014	4.6	14.5	31.9	13	20.6	0.2	0	0	0	1	4.4	1
Extreme values	32	56.9	31.9	**22.6**	20.6	1	0	12	0	1	19	44.3

Table 15C. BAHLOOLI TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	1.5	2.1	2.2	2.6	2.9	3.1	3.8	3.2	2.6	2	1.5	2.8
2011	2.9	3.3	3.4	3.7	4.2	4.6	4.8	4.6	3.6	3.4	3.1	2.8
2012	3.4	3	3.9	3.3	4.1	4.5	5.1	3.9	3.4	2.9	2.6	2.4
2013	2.9	2.9	3.5	3.7	4	4.7	5	4.2	3.4	3.2	2.9	3
2014	2.8	2.8	4.1	3.6	3.9	4.7	5.1	4.5	3.7	3.3	3.1	2.7
Extreme values	3.4	3.3	4.1	3.7	4.2	4.7	**5.1**	4.6	3.7	3.4	3.1	3

Top average conditions for Bahlooli Tribe in their summer pastures are: temperature 28.9°C, precipitation 22.6 mm and wind speed 5.1 m/s.

Table 16: Bahlooli Tribe Location No.2. - Winter residence

LATITUDE 29 47 N, LONGITUDE 60 90 E, ELEVATION 1370 m a.s.l.
Source of data: Meteorological station: Sistan & Baluchestan Province, Zahedan

Table 16A: BAHLOOLI TRIBE, WINTER,AVERAGE OF MONTHLY TEMPERATURE [°C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	9.4	12	18.7	22.9	26.9	29.8	30.2	28	22.8	20.6	10.7	6.4
2011	7.1	9.8	15.3	21.5	27.6	30.6	29.6	29.4	24.5	19.8	15.1	5.4
2012	7.4	7.6	16	20.3	27	28.2	30.6	28.5	23.4	18.5	13.2	8
2013	8.2	11.5	17.2	20.1	25.8	30.6	30.6	28.3	25.9	20	12.2	7.3
2014	6.2	5	14.1	21.9	25	29.9	30.3	28	25.9	20.2	12.2	7.4
Extreme values	9.4	12	18.7	22.9	27.6	30.6	30.6	29.4	25.9	20.2	15.1	**8**

Table 16B: Bahlooli TRIBE, WINTER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	0	20.3	0	0.1	12.8	0	0	0	0	2	0	0
2011	9.4	58.2	18.7	15.9	11.6	0	0	0	0	4.4	0	0
2012	10.7	8	0	24.2	0	0.1	0	0	0.1	0.2	0.4	18.7
2013	6.1	2.7	8.7	21.9	0.9	0.1	0	4.3	1	0.1	5.3	0.3
2014	26.6	4.6	29.7	7.6	1.7	0	0	0	0	0.3	0	0
Extreme values	26.6	**58.2**	29.7	24.2	12.8	0	0	4.3	1	4.4	5.3	18.7

Table 16C: BAHLOOLI TRIBE, WINTER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3.4	5.4	3.4	3.1	3.2	3.8	3.7	3	2.8	2.8	1.9	2
2011	3.1	4.5	3.4	3.7	3.5	3.9	3.7	3	2.5	2.4	3.4	2.5
2012	3.7	4.7	5.3	3.4	3.6	4	3.6	2.7	3.1	2.8	2.9	3.4
2013	4.1	4.5	4.6	3.8	3.6	3.6	3.3	3.1	2.4	2.3	2.4	3.1
2014	2.8	3.1	3.9	4.2	2.9	3.7	3.3	3.2	3	3	3.3	2.3
Extreme values	4.1	**5.4**	5.3	4.2	3.6	4	3.7	3.2	3.1	3	3.4	3.4

Top average conditions for Kormanj Tribe in winter are as follows: lowest average temperature 8°C, highest average precipitation 58.2 mm, highest average wind speed in winter is 5.4 m/s.

Bahlooli Tribe - recapitulation

In summer, they encounter top average temperatures around 28.9°C, while in the area of their winter stay, top average temperature is 30.6°C. Precipitation in summer is up to 22.6 mm, while at the same time their winter pastures suffer period of drought with four months of 24.2 mm rainfall. Wind speed in their summer residences is around 5.1 m/s as the top average value, while in the area of their winter stay, at the same time the winds are twice as strong 4.2 m/s.
Alternatively, in winters, as Bahlooli Tribe seeks warmer place, and they settle in the area where winter top highest temperature is 20.2°C. It is not so different than the place where they stay in summers, with 19.3°C as top average temperatures. The precipitation is concerned amounts to 58.2 mm in their winter place, at the same time the summer location would have up to 56.9 mm top average rainfall, this alternative is not so different between summer and winter places. In the case of wind, the top average speed values are around 5.4 m/s, while in summer location it is slightly lower, and amounts to 4.1 m/s.

In general, Bahlooli Tribe does not significant change latitude of their pastures. The both place for living of the Bahlooli Tribe do not so different. But during an interview with Balooli nomads, they said that in the past, the weather conditions were better at their summer residence.

3.2.7 Tribe Soleimani in Kerman Province

Fig. 64: Kerman Province locationin Iran, Soleimani Tribe, No. 1 summer resident, No.2 winter resident, by author

Table 17: Soleimani Tribe Location No.1 – Summer residence

LATITUDE 30 80 N, LONGITUDE 56 57 E, ELEVATION 1670 m a.s.l.
Source of data: Meteorological station: Kerman Province, Zarand

Table 17A: SOLEIMANITRIBE, SUMMER,AVERAGE OF MONTHLY TEMPERATURE [^{o}C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	10.6	12.1	18.7	21.7	26.4	30.8	32.6	28	25	22.6	12.3	8.6
2011	7.4	8.8	14.1	21.3	27.5	32	30.9	30.9	26.3	20.9	13.9	7.5
2012	8.2	7.3	14	19.3	26.3	28.6	31.2	29.1	26.1	19.7	13.4	8.6
2013	9	10.9	16	19.1	24.9	31.8	32.8	29.8	27.6	21.2	13.6	8.5
2014	5.7	5.9	13.7	21.1	24.7	30.7	32	29.8	27.9	20.8	12	8.8
Extreme values	10.6	12.1	18.7	21.7	27.5	31.8	**32.8**	30.9	27.9	22.6	13.9	8.8

Table 17B: SOLEIMANI TRIBE, SUMMER,TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	2	19	3	0.6	2.9	0	0	0	0	0	0	0
2011	9.6	67	9.3	9.6	0	0	0	0.4	0	0	5.8	0
2012	0.6	38.7	3.3	12	1.2	0.7	0	0	0	0.4	27.5	21.7
2013	3.9	11.9	12	35	13	0	0	3.1	0	0.5	7.9	0
2014	34.7	31	32.8	14	10.3	0	0	0	0	0.3	13.8	12
Extreme values	34.7	67	32.8	**35**	10.3	0.7	0	3.1	0	0.5	27.5	21.7

Table 17C: SOLEIMANI TRIBE, SUMMER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3.1	4.2	4	4	4	4.3	4.9	4.2	3.8	3	2.1	2.2
2011	2.9	3.4	3.9	4.4	3.7	4.1	5.2	4.7	4.2	3.6	4	3
2012	4.4	4.3	5.7	4.4	5	5.2	5	4.7	4.9	3.7	2.8	3.1
2013	4	4.3	4.8	4.4	3.9	4.5	5.4	4.8	4	3.2	3.1	4
2014	3	3.5	4.8	4.9	4.5	4.7	4.9	4.9	4.7	4.2	4	2.7
Extreme values	4.4	4.3	5.7	4.9	4.5	5.2	**5.4**	4.9	4.9	4.2	4	4

Top average conditions for Soleimani Tribe in their summer pastures are: temperature 32.8°C, precipitation 35 mm and wind speed 5.4 m/s.

Table 18: Soleimani Tribe Location No.2. - Winter residence

LATITUDE 27 99 N, LONGITUDE 57 71 E, ELEVATION 499 m a.s.l.
Source of data: Meteorological station: Kerman Province, Kahnouj

Table 18A: SOLEIMANITRIBE, WINTER,AVERAGE OF MONTHLY TEMPERATURE [°C]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	16.2	17.5	24.6	28.9	33.5	36.2	36.7	35.9	33.4	29.7	19.6	14.6
2011	14.3	16.7	22.4	28.4	34.3	37.7	37.1	35.8	34.3	28.2	21.9	13.8
2012	14.9	15.2	21.2	27.1	34.9	36.8	37.7	36.5	34.2	28	22.1	15.8
2013	14.9	17.5	22.6	26.8	32.1	35.7	36.9	34.5	33.3	29.4	21	15.6
2014	13.1	13.8	20.5	28.4	32.7	37	37.1	35.3	33.4	28.5	20.2	15.7
Extreme values	16.2	17.5	24.6	28.9	34.9	37.7	37.7	36.5	34.3	29.7	22.1	**15.8**

Table 18B: SOLEIMANI TRIBE, WINTER, TOTAL MONTHLY PRECIPITATION [mm]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3	101	0.3	0	0	29	0	1	0	16	0	0
2011	61.8	91.2	5.9	0	14.5	0	0	12	0	1	11	0
2012	0.6	54.3	5	0	0	0	0	7	0	0	10.7	18
2013	18	64.7	27.4	53.7	1	0	0	12.2	3.4	2	13.2	0
2014	55.4	31	99.8	0.6	7.1	0.1	4.6	7.4	0.5	0	4.1	0.2
Extreme values	61.8	**101**	99.8	53.7	14.5	29	4.6	12.2	3.4	16	13.2	18

Table 18C: SOLEIMANI TRIBE, WINTER, AVERAGE OF MONTHLY WIND SPEED [m/s]

Year	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
2010	3.5	3.7	5.3	6.6	6.2	6.2	7.7	4.6	3.7	3.8	1.6	1.8
2011	2.3	4	4	5.5	6.2	6.9	7.1	7.6	4.7	4.8	3.6	2
2012	3.5	4.3	5.7	5.4	3.7	5.4	7.3	6.2	4.7	3.7	2.6	2.3
2013	3.7	3.9	5.4	6.6	7.2	8.2	8.3	7.6	7.4	4.5	2.6	3.3
2014	2.7	3.3	5	5.6	6.1	6.2	7.5	7.3	6.3	4.6	3.6	2.6
Extreme values	3.7	4.3	**5.7**	6.6	7.2	8.2	8.3	7.6	7.4	4.8	3.6	3.3

Top average conditions for Soleimani Tribe in winter are as follows: lowest average temperature 15.8°C, highest average precipitation 101 mm, highest average wind speed in winter is 5.7 m/s.

Soleimani Tribe - recapitulation

In summer, they encounter top average temperatures around 32.8°C, while in the area of their winter stay, top average temperature is 37.7°C. Precipitation in summer is up to 35 mm, while at the same time their winter pastures is 53.7 mm rainfall. Wind speed in their summer residences is around 5.4 m/s, as the top average value, while in the area of their winter stay, at the same time the wind is strong 8.3 m/s.Therefore, their summer place is more comfortable than their winter residence areain that time.

Alternatively, in winters, as Soleimani Tribe seeks warmer place, and they settle in the area where winter the lowest temperature is 15.8°C. It is much warmer than in the places where they stay in summers, with 8.8°C as lowest average temperatures. The precipitation amounts to 101 mm in their winter placeand at the same time the summer location would have up to 34.7 mm top average rainfall. In the case of wind, the top average speed values are around 5.7 m/s, and the same in summer location.

In general the tents of Soleimani Tribe undergo large strain from rainfall in winter and wind that endangers their performance in both locations.

3.3 Recapitulation of the climate-trail dependence in chosen Iranian nomadic tribes

Climate change in recent years is visible in Iran. These survey covers years from 2010 to 2014. In the last years the climate has changed dramatically, with much higher temperatures and diminishing rainfall – which is very unfavorable for herders.

Presentwd above data of climatic situations on the trails of the analyzed seven nomad tribes will allow to check conformity of the structures of the tents with the occurrences they encounter while pitched in summer or winter places of residence.

Summarizing the results of this part of the research it must be said, that although the trails of nomads were covering land with different climatic profiles they always provided most comfortable situation for the people and their animals.

4 TYPOLOGY OF THE CHOSEN BLACK TENTS BULT IN TRADITION OF IRANIAN NOMADIC TRIBES

4.1 Architecture of the Black Tents in Iran – typology

Architecture of Black Tents is intricate and diversified, although seems to be very simple. It shows the relation of nomads' technical skills with nature. All the materials belong to their natural environment and for the most of tribes, they are almost the same.

In this chapter fixed and variable elements and solutions applied to the tents' structures are discussed.

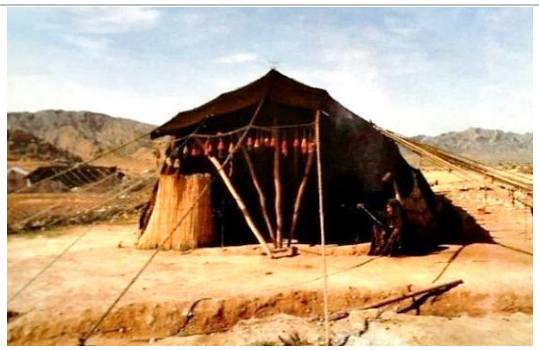
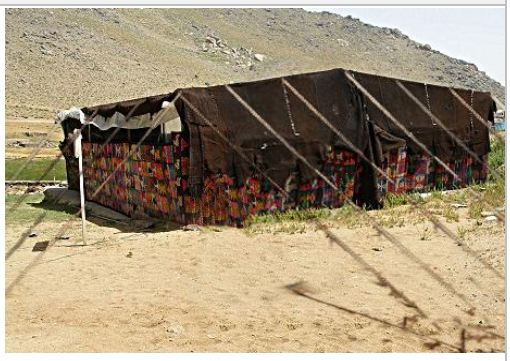
As it was mentioned in the Chapter 0Iran has much more nomadic tribes in different provinces, but for the research the ones in adverse climatic conditions (mild and harsh climate) were chosen. Climatic aspect of their nomadic life were presented in the previous chapter. Author decided to choose seven tribes in different geographic and climatic situations.

Fig. 65:Location of the seven tribes in seven provinces of Iran.Map: Bakhtiari, S, 1984, p. 38

Regions where analysis of Iranian nomads' Black Tents is undertaken:

1. Qashqai Tribe in Fars Province
2. Arkovazi Tribe in Ilam Province
3. YaromTatli Tribe in Hamedan Province
4. Garapapakh Tribe in West-Azarbayjan Province
5. Kormanj Tribe in Golestan Province
6. Bahlooli Tribe in Sistan Province
7. Soleimani Tribe in Kerman Province

Table 19: Black Tents of the seven tribes

	
1A. Tribe Qashqai in Fars Province. Winter Black tent, photo by M. Kiani	1B. Tribe Qashqai in Fars Province. Summer Black tent, photo by author
	
2. Tribe Arkovazi in Ilam Province, photo by M. Moghadam	3. Tribe YaromTatli in Hamedan Province, photo by author
	
4. Tribe Garapapakh in West-Azarbayjan Province. photo by author	5. Tribe Kormanj in Golestan Province, photo by author
	
6. Tribe Bahlooli in Sistan Province https://www.irna.ir/news/82611745/304	7. Tribe Soleimani in Kerman Province, photo by author

4.2 Functional analysis (interiors) of the Black Tents in Iran

Nomadic people created flexible interiors which are divided by decorations and furnishings, making the functional layouts of the tents very similar to a house. Partitions are built with bags, saddlebags, bedding and other belongings not needed in a moment. This kind of separation, without walls contributes to airness, simplicity and fluidity of internal space of tents.

The place for cooking – a small kitchen is arranged inside, near to the entrance, followed by a granary, with sleeping spaces further inside. In summer the kitchens are moved outside the tents.

In winter and summer, in Fars Province, Qashqai nomad's Black Tent has different plan, construction and arrangement, decorations and position of the entrance door, but materials used for constructing it in summer and winter are the same. In summer the construction open, higher and spacious as the furnishings are arranged in a different way. Summer weather conditions allow for more freedom and contact with the surroundings.

The other tribes built the same structure of a tent with the same elements in winter and summer but the plan of the interior and furnishings are arranged in a different way. There are, however, exceptions, when the tribe lives in permanent winter houses – as it is mentioned further in the Chapter 4.2.

Internal organization and decorations of the Black Tent differ according to the status of the family. Tents have two main parts, for men and women. Within the tents, in special mens' part there is,appropriately kept, space prepared for guests.

Poorer families tents have smaller dimensions and their interior is organized with the essential housekeeping appliances. The people of lower social status have fewer facilities and less comfort for themselves and also for the hospitality function. The discipline of interiorof their tents is much lower. In khan`s[21] families who have higher social status there is no chaos, as large tents have diversified living facilities and spaces. Rich families are able to accommodate guests in large numbers by using their numerous amenities, so guests are common in such families. (Kiani, M., 2006.p. 63).

In the tents dining, lodging, kitchen and warehouse are situated at the corners. Their location and arrangement is stable and each part of the tent is a place for a particular furnishing and function. This differs between the families, according to their class and culture level but there are some general principles common for all tents.

In a rectangular tent, the summer entrance will be placed in a longer wall, while in winter it will be moved to the shorter wall.

Common features of layouts:men' accessories and the necessities prepared for a guest are placed in the right corner from the entrance and women`s accessories and kitchen service in the left corner of the tent, past the entrance. There is a low wall/partition along a longer wallto put the travelling bags and facilities on it. This is a place is safe from moisture, wind and dust brought from the entrance Stones are placed on the ground and levelled, and sacks full of flour, wheat, barley, rice and beans are placed on them. Such "larder" is easy to reach, when the products are needed

[21] Head of a tribe. For more information, follow the Chapter. 2.5.

guest's bed, guns and rarely used ladies' clothes are stacked on the top of the food bags.

family bed is unfolded every night and disassembled in the morning and placed on the top of this "wall". Folded *jajims* and *kilims* are kept on the beds and finally the pillows with different colours decorate the whole "wall" creating colorful element inside the tent. There is an old method of pressing/ironing dresses between the layers of these goods Some of the families cover all those appliances with a special large kilims as long as a tent, and hide all the possessions, achieving a unified, decorated look of the "wall".

Fig. 66:Black Tent of Qashqai Tribe, Fars Province: the wall of the Tent with its facilities,photo by author

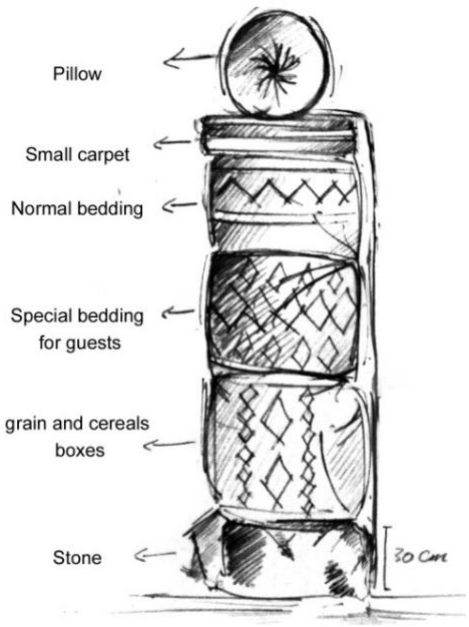


Fig. 67:Black Tent of Qashqai Tribe, Fars Province. Section of a wall of the tent with its facilities,drawing by author

Some tribes make a partitioning wall with cobbles, sacks and beds and locate it in 1/3 length of the tent, or divide it into two parts by Chigh. In such case, the smaller part can be easily warmed up, so the back part of tent is used as a kitchen and a warehouse. Sometimes, at the end of winter, when the weather breaks down, baby lambs are kept there also, to save them from frost.

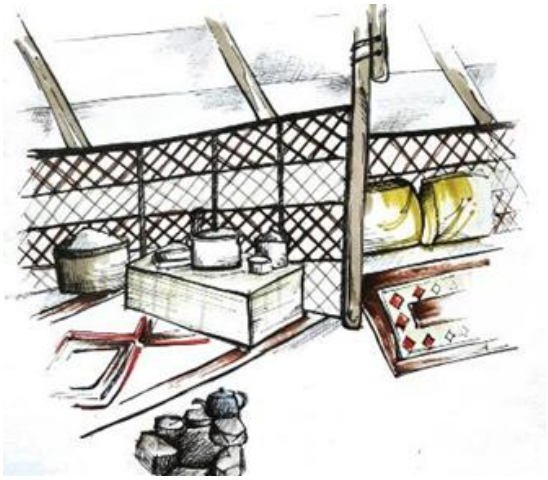


Fig. 68:View of the interior of the Tent and kitchen,drawing by author

Fig. 69:View of the back of thetentbehind the kitchen,where in bad weatherbaby-lambsare kept, photo by M. Moghadam

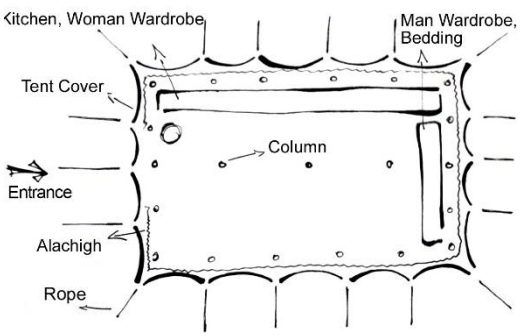
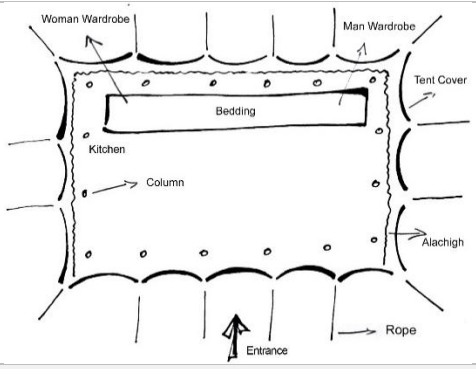
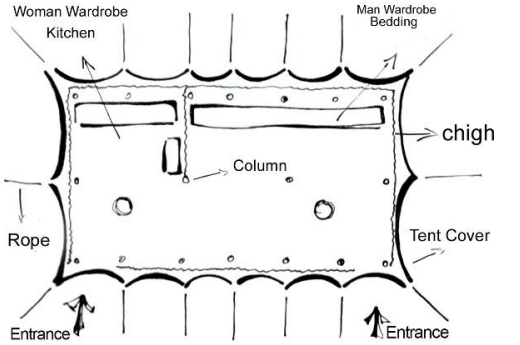
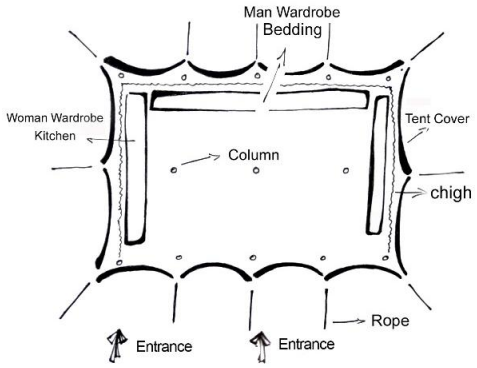
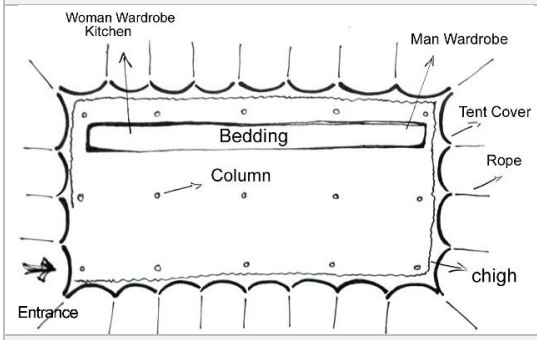
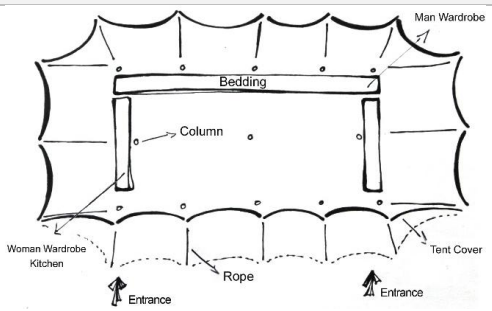
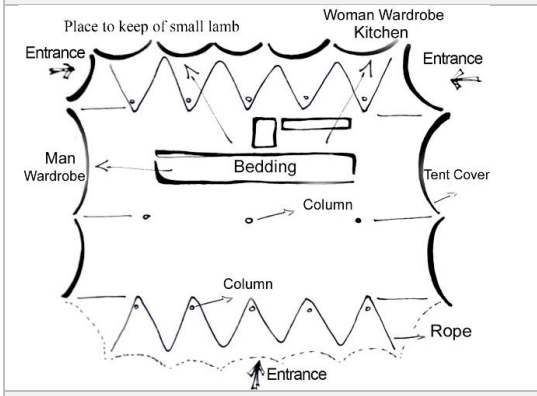
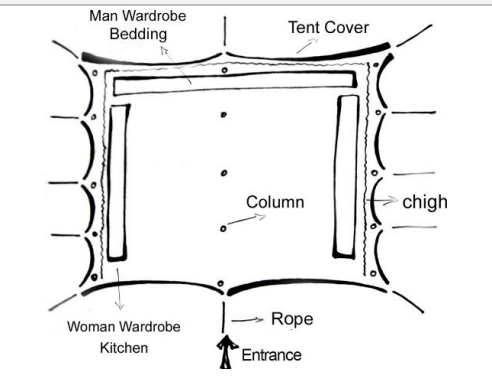
There are two places for oven or a fireplace in two sides of tent, used when guests come, as men and women sit separately. But in everyday situation the oven is on the left side of the entrance, as this part of a tent belongs to women and kitchen equipment. Nowadays instead of charcoal oven they use gas stoves and sometimes in summer they move stove and kitchen equipment out of a tent.

Fig. 70:View of summer kitchen out of the tent, Qashqai tribe, Fars Province, photo by author

The following drawings were initial part of the survey, they were prepared by the author and allowed to assess initial differences between winter and summer types of structures, with reference to the volumes (Table 19) of these tents. They allowed to put forward the theses about dependence between climate and tents' construction. They also helped to analyze arrangement of interiors in different parts of Iran.

Fig. 71:View of the inside of the Black tent, Ilam Province. This family has is poorer and thier tent is not so regular and nice, photo by author

Table 20:Plan drawings of Black Tents and equipment they contain,drawing by author

	
Tribe 1. Winter Black Tent planof Fars Province. 3-5m wide/ 6-12 m long	Tribe 1. Summer Black Tent plan of Fars Province. 3-5m wide/ 6-12 m long
	
Tribe 2. Plan of Ilam Province tent. 2-4 m wide/ 10-12 m long	Tribe 3. Plan of Hamedan Province tent. 10 m wide/ 10-12 m long
	
Tribe 4. Plan of West Azerbayjan Province tent. 3-4 m wide/ 10-12 m long	Tribe 5. Plan of Golestan Province tent. 4 m wide/ 9 m long
	
Tribe 6. Plan of Sistan Province tent. 3-5 m wide/ 7-9 m long	Tribe 7. Plan of Kerman Province tent. 4 m wide/ 5 m long

First look at the sizes and volumes (Table 19) of the tents gives out a climatic influence: variety of elongated or square layouts, supported along the middle axis, or freely spaced, uncovers subordination to different climates, which also rules the lives of the tribes.

4.3 Assemblingthe Black Tents

4.3.1 Black Tent Setup

This part of research is based on field studies held by the author in 2012 in the Qashqai Tribe in Fars Province and studies by Lennart Edelberg from the 1964 of the tribes from Jalalvand, Baland and Osmanwand in the Hulilan plain of Ilam Province. The results confirm that the methods of assembling, disassembling and packing the tents for journey have not changed. All the findings show thatcontemporary method of setting up these tents is the same.

Activities performed while unpacking the tent are as follows: cleaning the place that is suitable for the tent. Then woven roof cover is spread on the ground. In some households, the columns are placed under the cover on the floor.

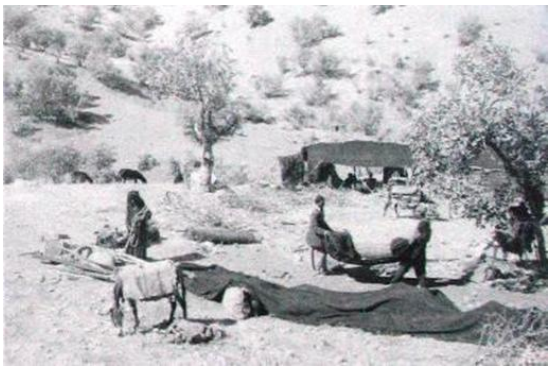


Fig. 72:Preparing for a tent assembly,Photo by Edelberg, 1964, source: Digard, J.P., 1990, p. 117

Taking into consideration the length and width of the tent, wooden pegs have to be hammered in the ground in a distance about 3 meters from the walls. Ropes, which stretch roof and support posts along the walls must be then tied around the pegs.

Fig. 73:Wooden pin, photo by, Edelberg,1964,source: Digard, J.P., 1990, p. 101.

Fig. 74:Pins and ropes surround a tent, photo by author

Wooden hooks are attached to corner posts of tents. The post top is V-shaped, like a fork and rope connect to this.

Fig. 75:Connection of tent corner to the wooden hook, photo by author

The central columns on both ends are placed under the fabric of the roof and then lifted into their slanting position. Then the edge of a tent is lifted and fastened.

Fig. 76: Slanting position of corner columns Photo by author

Fig. 77:Qashqai Tribe in Fars Province. Pitching the roof by lifting the end columns, photo by author

Fig. 78:Corner postson both sidesare lifted, photo by, Edelberg.1964, source: Digard, J.P., 1990, p. 117

The central columns at the two ends of a tent are raised as the first ones by the method explained above, and the tent is almost ready.The central columns of the interior of the tent are placed under the fabric, short ridge beams are place on the top of them and the fabric of a roof is lifted.

Fig. 79:Pulling up the end and the middle column which carries a ridge beam, photo.

Fig. 80:Lifting the middle column with the ridge beam, photo by author

Fig. 81:Middle column with a ridge beam, photo by author

Depending on the situation and the tribe, sometimes a pit is dug to place the basis of the column, but sometimes it is placed right on the ground. After the tent is stabilized, the posts on both sides of a tent are arranged in a form of a cross to stiffen the structure. This form differs throughout the regions.

Fig. 82:Digging the end column into the ground, photo by author

Fig. 83:The posts are arranged along the walls of the tent in a criss-crossed way (bracings), photo by author

Then the outer ropes which were loose have to be tightened by pulling up the rope knots, which stabilizes the midline of the cover.

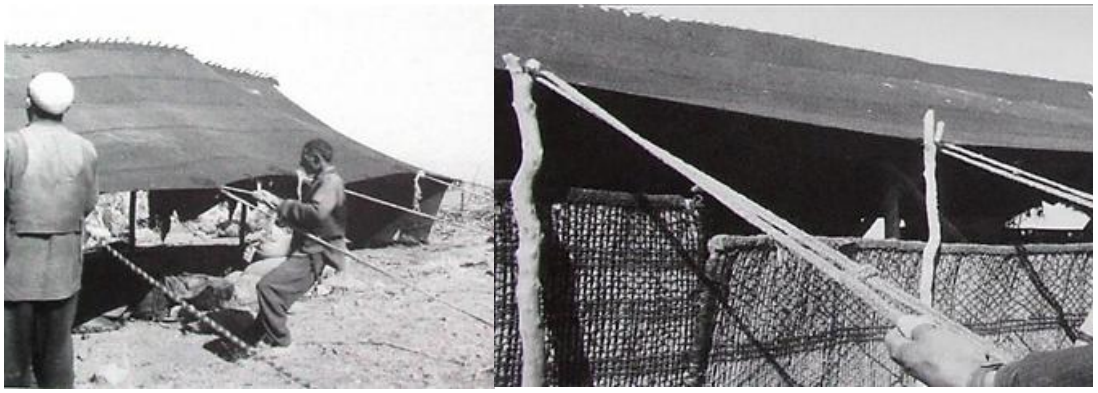


Fig. 84:Setting ropes, photo by, Edelberg, 1964, source: Digard, J.P., 1990, p. 122.

Next, the tent walls are connected with the edge of the roof with thin wooden slits (pins). The pin is pierced through the edge of tent cover, then pierced through the edge of wall fabric and rotated by the hand, and inserted into the fabric of the cover from below.

Fig. 85:Wall and roof of the tent are connected by wooden pins, photo by author

Fig. 86:Piercing the cover with thin pins in roughly 20 cm distances to brace the edge, photo by author

When the walls and the roof are connected, the Chigh roll is unwind to secure the wall. The posts, which are woven into it in regular distances are hammered into ground. Chigh is unrolled around the whole length of the wall of a tent, with exception of the entrance. The other way of securing the side wall of the tent is to ram into ground many thin branches, that would prevent movements of the wall caused by wind.

Fig. 87: Thin branches are rammed/pounded into the ground and Chigh is unwind to support the wall, photo by author

Fig. 88: This Black tent was assembled by the author and members of Qashqai Tribe

4.3.2 Summer structure of Qashqai Tribe Black Tent

In summer because of the heat, the longitudinal side of the tent is left open and the bags with belongings and the Chigh are not standing along this wall. The posts that encircle the tent are vertical, so as a result the tent roof is not sloping. In some tents the columns remain slightly tilted to protect the tent in case of strong winds.

Summer tents take more cuboid form than winter structures. Their dark color causes absorption of solar radiation, which is unfavorable, but the height of posts, columns and

lifted walls cause air circulation lowering the temperature under the roof. This seasonal change in structure is typical of the Black Tents of Qashqai Tribe in Fars Province.

Fig. 89:Summer Tent decorated in Qashqai Tribe, Fars Province, photo by author

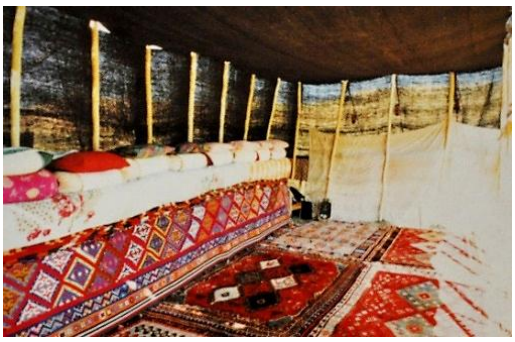


Fig. 90: Qashqai Tribe, Fars Province. Locating of oblique posts, photo by M.Kiani

Winter architecture of Qashqai Tribe Black Tent

Winter changes are made to the tent to uplift it and prepare to cope with cold, wind and storm, providing secure shelter. The changes include:

general lowering of the tent's height by making vertical posts oblique all around the tent, so the height of the wall diminishes

the wall is mounted also along the formerly open side of the tent

X construction of the posts, which lowers the wall, supports the fabric and makes the wall more resistant to winds

diminishing the size of the entrance by leaving only small door in a shorter wall

as the walls are much lower, the roof has bigger slope, typical for a saddle roof. This problem will be discussed more widely in the chapters4 and 5 while analyzing the model structure of the Black Tents.

central columns support two kinds of a carrier beams and two kinds of joints are used: a dove-tail tip of a column holds cylindrical ridge beam. In a case of board-type ridge beam the tip of a column is set into a round nest pierced in this board.

Fig. 91: Qashqai Tribe, Fars Province. Oblique posts around tent wall, photo by author

Fig. 92: Qashqai Tribe, Fars Province. The interior of a winter tent with the posts set in slanting way

Fig. 93: Qashqai Tribe, Fars Province, two kinds of ridge support by a column, photo by author

4.4 Typology of elements of Black Tents structure

Typology of the Tents of seven Iranian tribes living in different geographic situations and adhering to their idiosyncratic cultures would provide grounds for the research and also assumptions for protection and conservation of the Black Tents as a vernacular occurrence.

This research had been started from Qashqai tribe in Fars Province (Tribe No. 1), therefore this part of research has more detailed information and in order to avoid repetition, the information concerning the other provinces will concentrate on the elements that differ from the structures, ways and details of the Qashqai Tribe.

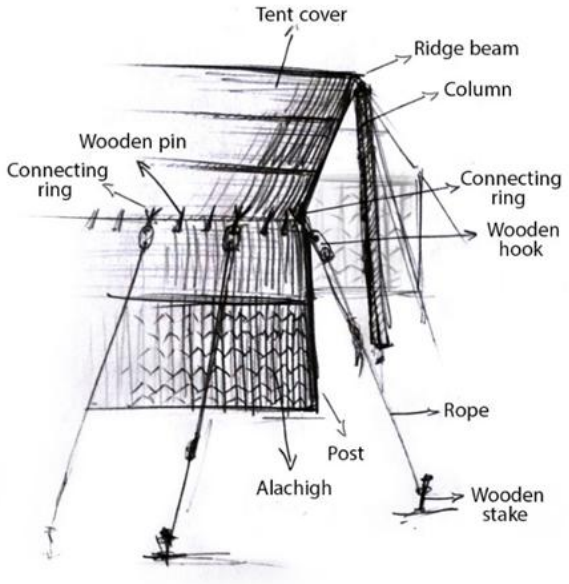


Fig. 94:Structure of Black Tent of Qashqai Tribe, Fars Province, drawing by author

4.4.1 Tribe Qashqai in Fars Province

Tent coverconsists of two parts: roof/ceiling and wall and both are woven with the goat's hair.The method of preparation of the fabric for both covers and their texture is the same.

Strips of the tent cover - according to economic situation of families, the tents are 6 to 12 meters long and 3 to 5 meters wide, which means that their area varies from 18 to 60 square meters. Weaving a piece of this size causes a lot of problems, the need for a big workshop for weaving and weight of the heavy cover for transport. Also in the case of weaving large strips it is difficult to weave them tight. After some time, they become loose and their water resistance is insufficient. Therefore, the cover consists of narrow strips about 60 to 80 cm wide, so if there is a damage only one strip must be changed. The new part of the cover is sewn into place with goats' hair yarn.

Walls of Black Tents are rectangles, 6 to 12 m long, and only 1.5-2.5 m wide. Like the roof they are made of horizontal strips and connected with the roof with wooden pins. The length of the wall must suffice to cover the perimeter of a tent, with exception of its entrance.

The strips woven for the walls are usually wider because they are not so loaded and do not undergo the same traction and pressure as the roof fabric. Sometimes, when the roof cover is used for some years and is worn out, it is used as a wall.

Fig. 95:Narrow strips of Black Tent roof cover are sewn together and while on the roof, the seams are parallel to the ridge of the roof ;Qashqai Tribe, Fars Province, photo by author

Wooden pins connect the tent wall with the roof edge. It is the quickest way to assemble and disassemble two elements of the cover of the tent. The pins are made from tamarisk (Tamarix L.) branches, as this timber is light and solid, and accessible in the desert as well as near to the rivers. Branches of diameter less than 1 cm and 20 cm long and straight are shaved from bark and sharpened to pierce the fabric easily. The pins are pinned around the edge of roof in 20-25 cm distances. They are not seen from the inside of the tent.

Fig. 96:A wooden pin, photo by author

Connection rings (edge clamps)these are made of goat's hair ropes. In a way they are similar to plaits and are stitched to the edges of a tent roof with yarn also made from goats' hair. Distance between the edge clamps is 60 to 80 cm. all around the roof. The other end of each clamp is fastened around wooden hooks where the ropes holding the tent in position are knotted. The larger is the number of clamps is the safer is the tent in case of strong wind, as the load is distributed more evenly on the surface of the roof. The length of a corner clamp is about 20 cm and thickness of the clamp is about 3 cm.
These corner clamps (or connection rings) tear earlier than the other parts of the tents as a result of tension and a lot of friction due to movements in the wind and precipitation. As a result, they should be changed at least every two years. If the pressure of a tent fabric is too big and the clamp is worn out it can be easily exchanged for a new one.

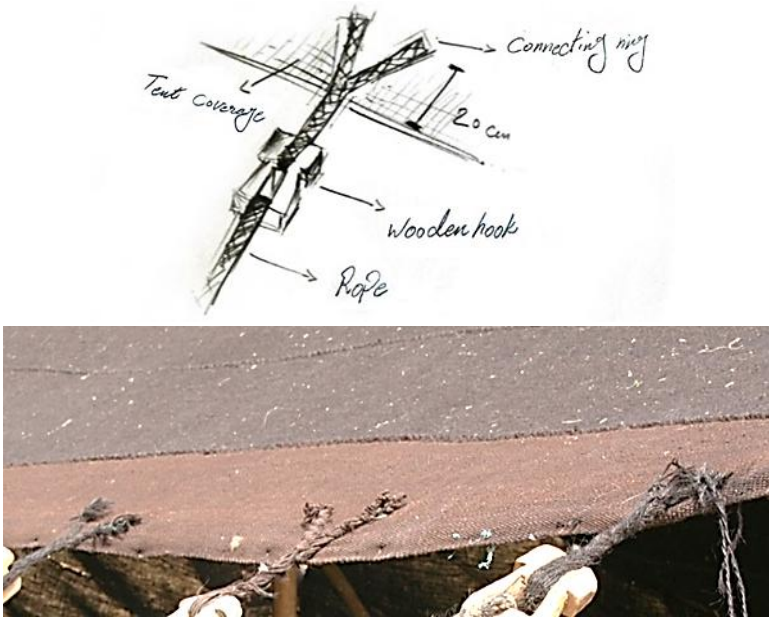


Fig. 97:Connecting ring of Black Tent . Qashqai Tribe, Fars Province, photo by author

Wooden hooks "belong" to the edge of the roof, as they are hooked on the clamps, that are sewn to fabric edge. The hooks are shaped in such way, that on one side the clamps are attached to them, and on the other ropes that stretch the tent. The wooden hooks differ in shape even within the same tribe, but they are always made of hard and resistant timber, as they must withstand tearing power exerted by a clamp and a rope.

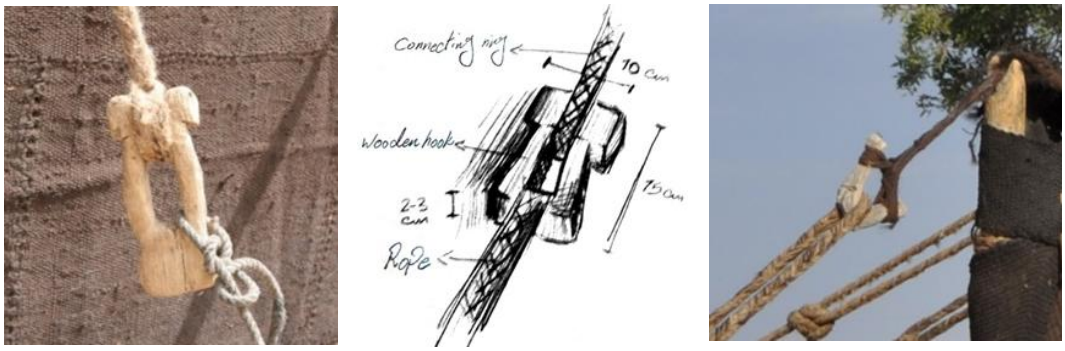


Fig. 98:Two types of wooden hooksin Qashqai Tribe, Fars Province, photo by author

Ropes are made of fleece or goats hair and sometimes with a mixture of both. Each tent needs 20 to 50 ropes between 8 and 10 meters long. The tent ropes are heavily loaded so they must be changed quite often. There is a special node in the middle of the rope to shorten it or make it longer.

Wooden Stakes The ropes are attached to the pegs pounded vertically into the ground. The length of the pegs is about 20 to 40 cm and their diameter is up to 5 cm. They have either appropriate shape or are incised in such way, that a rope bound to them would not slip off.In summer ground is dry and hard, if the pegs are properly rammed, they can hold the tent safely, but in winter, because of rain and soft soil they may be pulled out by a rocking tent. To prevent it the pegs are secured by big stones to stabilize them.

Fig. 99:Ropes of Black Tent . Qashqai Tribe, FarsProvince, photo by author

Fig. 100:Wooden stake/peg, photo by author

Column - a wooden pillar, 2-2.5 meter- high and 8 to 10 cm diameter. The trunks of young spruce or poplar trees are light and with no knots, that make them warp when drying. Upper ends are indented in dovetail way (V shape) to hold ridge carrier beam. The height of the columns secures the slopes of the saddle roof and volume of the tent.

Posts - The posts encircling the tent are flat ended as they support edges of the roof.

Alachigh or Chigh - "ala" is a Turkish word and it means zig-zag in black and white – and this is the colour of this matt. Light colour of debarked branches and twigs contrasts with colour of string made of goat's hair. The string binds the matts and creates design. Chigh surrounds the wall of the tent making it stronger, guards against wind and dust and makes tents beautiful. Making Chigh is one of the crafts of nomadic people and their design differs from tribe to tribe. Alachigh consists of two identical pieces of 1.5

meter width and between 6 and 10 meters long. It is woven with branches and twigs and stands on the ground. When it is rainy or extremely cold it can move to the entrance of a tent and used as a wind shelter. The Alachigh is fastened in its position along the wall, by wooden pillars about 1.5 meter high, pounded into the ground.

Fig. 101: Alachigh of Black Tent of Qashqai Tribe, Fars Province, photo by author

4.4.2 Tribe Arkovazi in Ilam Province

Fig. 102:Black Tent purchased by Edelberg for ethnographic division of Mosgard Museum, 1964[22]

Fig. 103:Tent with Stone wall near of this,photo by M. Moghadam

Tent cover of Arkovazi Tribe consists of two elements: roof and wall that are both made with goat's hair and the method of preparation and the texture of both is the same. The way they are woven and assembled is the same like in Qashqai Tribe in Fars Province.
Usually the cover of the roof of the Black Tent of Arkovazi Tribe consists of 12 narrow strips 80 to 100 cm wide. These tents are narrower than the Qashaqi Tribe tents and they form rectangles 12 to 10 m long and 2 to 4 meters wide Their size indicates economic situation of the family.

[22]He prepared the Black Tent of the Ilam Province for Ethnography Section of Mosgard Museum, in Denmark in 1964, source: Digard, J.P., 1990, p. 127.

Black Tent roof consists of two parts connected to each other in the middle (on the the ridge). Therefore at the edge of these two fabric strips there are loops. The loopsare fixedtogether with wooden pins along the ridge and along the edges, where the wall strip is added.

Pins that secure connection of the two loops knotted together are about 25 cm long They keep in place the loops sewn on both sides of the coverin such way that the edges overlap. It is very quick way to assemble and disassemble the tent roof. This detail is typical of Arkovazi Tribe.

Fig. 104:wooden pin, photo by author

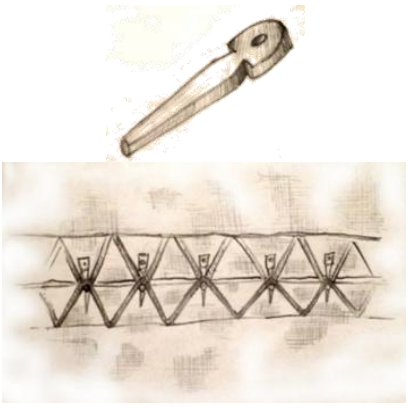


Fig. 105:connection of two parts of the roof with delicate strap or hook and wooden pin. Drawing by author

Corner clamp (Link ring)is made of goat hair and its texture is similar to a braid. It is stitched to the tent with a thread made of goat hair. Around the edges of the roof, every 80 to 100 cm there is a fastener/a catch made of goat's hair string, that allows connecting the edge with the tent rope. The larger is the number of these fasteners and hooks, less pressure on them makes the tent more stable.

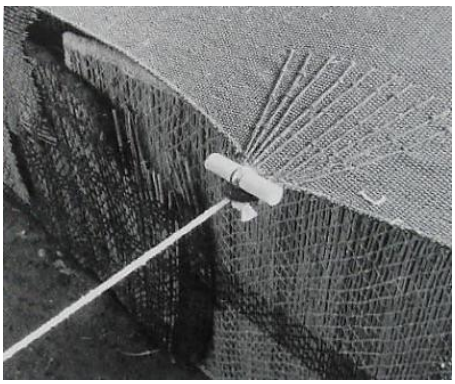


Fig. 106:Method of connection, photo by, Edelberg, 1964. Source: Digard J.P., 1990, p.124.

Fig. 107:Corner clamp (Connection ring), photo by M.Moghadam

Column 2 to 2.5 meter high and 8 to 10 cm in diameter. Quality of timber must be high, without knots, as they baear big loads. Arkovazi people, similarily as the other tribes use material that is on hand: young poplar and spruce trees. They construct the column with the two pieces of timber joined by rope, which is threaded through the holes in both

parts of the column. The lower, long part of it is a trunk, the top one is short and rectangular in section. The ridge of the tent is supported by wooden, rectangular ridge beams seated atop the upper part of the columns by means of mortise and tenon (hole and tongue) joint. These details contribute to bigger flexibility of the column itself and bigger resistance to wind of the whole tent. Arkovazi Tribe tents have 3 to 7 columns lined in the centre of the layout, and the number depends on the size of a tent.

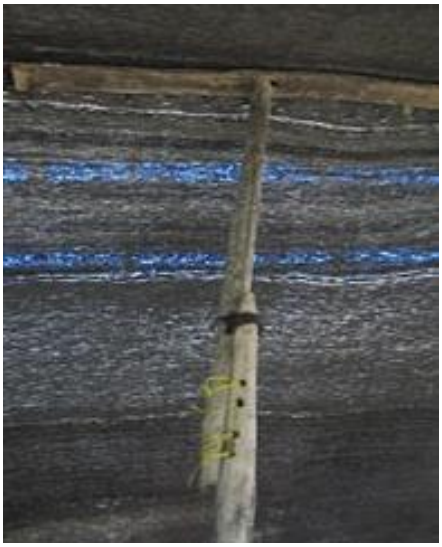


Fig. 108:The central column of Arkovazi tentand ridge beamseated on the top of it, the costruction covered with the roof fabric, photo by author

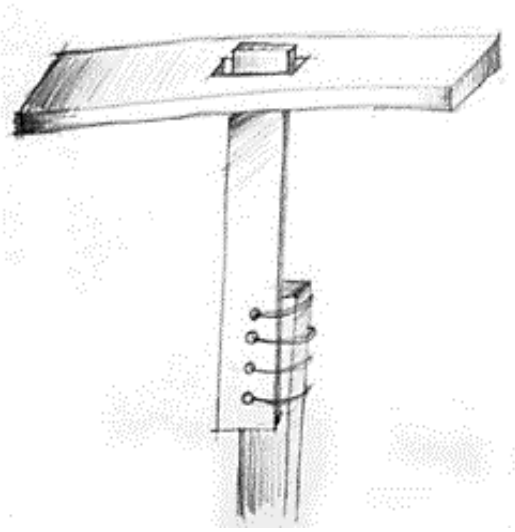


Fig. 109:Sketch of the construction supporting the ridge of the Arkovazi tent, column, its plank extension and ridge beam supporting the fabric, drawing by author

Post surrounding the tent and supporting the walls are of the same strong material as the columns but shorter to allow slope of the roof. They are fork-ended on the top to secure ropes that ground the tent.

Fig. 110:Forked ending of a post with supporting ropes stretching the roof sheet, photo by author

Fig. 111: Columns around of the tent, photo by M. Moghadam

ChIgh or **ChIt**- Arkovazi Tribe chigh consists of thin twigs and reeds that are woven together with coloured wool yarn. Chigh is used as an additional, solid wall, standing on the ground and protecting the interior from wind and dust. If it is colourful, with

intricate design and divides the parts of the tent it contributes to beauty of the interior. Usually the size of the chigh is 1.5 meters by 6 to 10 meters.

Fig. 112:Method of weaving of the Chigh, photo by author

Fig. 113:Arkovazi tribe *chigh* for bride's tent partition., photo by author

4.4.3 Yarom Tatli Tribe in Hamedan Province

Tent cover is made of goat's hair, similarily as the Black Tents of Qashqai Tribe in Fars Province. Usually YaromTatli Black Tent roof consists of 10 narrow strips of fabric, each up to 1 meter wide. Its square area is between 10 to 12 long and 10 meters wide.
Black tent roof in YaromTatli Tribe, like in Arkovazi's consists of two parts stitched at the ridge. The method of joining them is differentTwo upper-most strips of fabric are folded and is more strong and have sewn-on loops on their edge. The rope which is threaded through those loops joins the parts of the roof.

Fig. 114:YaromTatli Tribe. Method of connecting two sheets on the ridge of the roof. Two upper-most strips of fabric have sewn-on loops on their edge. The rope which is threaded through thoselops joins the parts of the roof, photo by author

Columns, as in the previous cases are wooden planks 2 to 2.5 meter long, 8 to 10 cm in diameter, uniform, without knots. In YaramTatli Tribe it is usually a pine tree, due to the area of their highland trail. Each tent has 3 to 5 columns in the centre, depending on the tent's dimensions. The ridge beams (carrier beams) have a hole (a socket) in the center.

It provides a lock for a tip of the column. The columns and the beams are called 'black wood' (*Qaraaqajeh*) in a dialect of YaramTatli.

Fig. 115:YaromTatli Tribe.The central column of the tent and its pass from the carrier beam on it to slope the tent, photo by author

Fig. 116:YaromTatli Tribe. Chigh. Photo by author

4.4.4 Tribe Garapapakh in West Azarbayjan Province

Tent cover of Garapapakh Tribe is made of fabric woven with goat's hair, in the same way as in the other Iranian nomads' tents. Usually the tents' covers are made by sewing together 8 to 10 narrow strips of fabric, maximum 1 meter wide. Garapapakh Tribe tents are between 10 and 12 long and narrow and only 3 to 4 meters wide. The strips of fabric used for the roofs are accordingly long.

Columnt :**s**he middle columns are 2.5 to 3 meters long and their diameter is about 8 to 10 cm. They are made of smooth and straight trunks provided by young walnut and sycamore trees. The columns have groove or incision on the top, named "*hacha*" on which supporting and stretching the roof ropes are hooked.

Fig. 117:Garapapakh Tribe. The columns are forked at the top and the end one has a roof cover loop and a stretching rope attached, photo by author

Fig. 118:Garapapakh Tribe.The dovetail incision on the top of the column keeps the loop sewn on the top of the fabric. Photo by author

4.4.5 Tribe Kormanj in Golestan Province

Tent of Kormanj Tribe is large. Its internal layout is usually more than 9 by 4 meters. The tent cover is a one-piece fabric and it hungs down to the ground at the back of it. In summer the front remains open, but in winter strips of the fabric could be added by

stitching them to the cover of the roof. Usually the cover consists of several strips of fabric sewn together, each not more than 1 meter wide. Along the ridge in the points of connections of these strips, openings for the columns are provided. They are secured from tearing by additional cushion made of fabricsewn in the most exposed points. It relieves the strain in time of pitching the tent and in stormy weather. The ridge is secured by a rope.

Fig. 119:Kormanj Tribe, the openingsin the fabric where the tips of columns stick out protected from inside and ourside from water leakage, photo by author

Fig. 120:Kormanj Tribe, the column sharpened tip sticks out and the “cushion” protects the opening in the fabric. The ridge is strengthened by a rope, photo by author

Column, a wooden pole, 2 to 2.5 meter long and 8 to 10 cm in diameter is smooth and straight and is usually provided by trunks of trees without knots. The columns have sharp tips to keep the fabric. Layers of additional fabric are put between the tip of a column and the cover of the roof to avoid piercing and to stop water penetration.
The posts round the tent are made of the same wood but shorter to form a slope.

4.4.6 Tribe Bahlooli in Sistan Province

Tent cover– the details are as described for Tribe No.1 Quashqai from Fars Province. Usually the tent cover consists of 3 to 5 strips of fabric maximum 1 meter wide, hence 3 Pelas tent or 5 Pelas tent (3 to 5 strips).
Ropesera made from goats’ fleece or hair and sometimes from a mixture of both. They are long enough to join and to tighten in a zig-zag way all the tops of columns and the pins on the ground along two parallel walls into one structure.

Fig. 121:Bahlooli Tribe.Zig-zag rope joins pins and columns around the tent, photo by author

Columns - Bahlooli Tribe columns are also made of high quality trunks of young trees 2.5 to 3 meters long and 8 to 10 cm in diameter. Usually the trunks of a poplar or a nutmeg tree are used. Each tent has 3 supporting columns in the centre. The tent's posts are of the same quality wood as the central columns when timber is concerned, but shorter, to set the slope of the roof. They have forked tips allowing to hold a loop of a tent cover and stretching ropes.

Fig. 122: Bahlooli Tribe. View of a Black Tent cover and position of its columns, photo by author

Fig. 123: Bahlooli Tribe. One of the posts around the tent, photo by author

While settled for winter, people of Bahlooli Tribe gather firewood for keeping the tents warm when temperature drops.The stock is placed inside the tent along the walls securing the interior from the bad weathermeanwhile.

4.4.7 Tribe Soleimani in Kerman Province

Tent cover fabric is similar to the other tents of the other Iranian nomads. The cover of a roof consists of four strips of fabric, thrown over the ridge orthogonally to it (across it) and joined by metal pins along the strips.

Fig. 124:Soleimani Tribe. Four parts of the tent's roof cover are joined by the metal pins, photo by author

Metal pins are shaped as needles for better use while mounting and dismounting the tent. While connecting adjoining strips of the fabric, a rope is threaded through their

hooks, and because of this, by one pull of it, strips of fabric are separated. They can be rolled for travel very quickly.

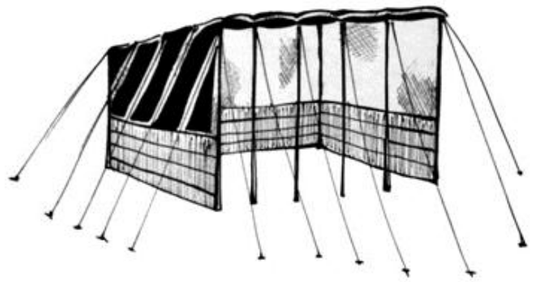
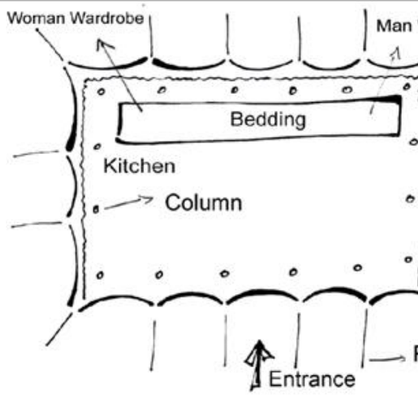
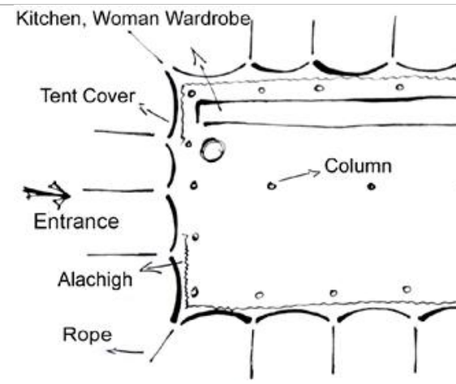
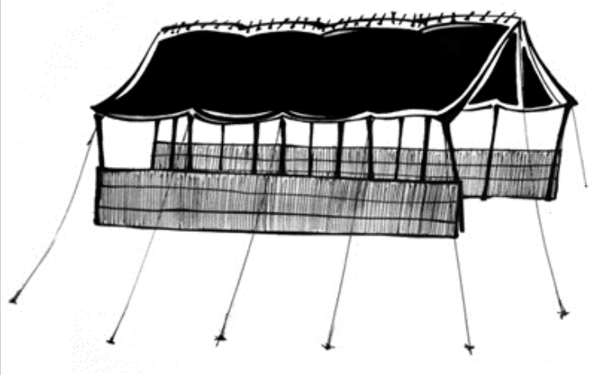
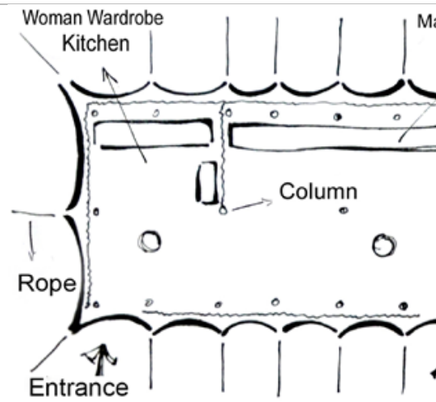
Fig. 125: Soleimani Tribe. Metal pin with a hook for threading the rope, photo by author

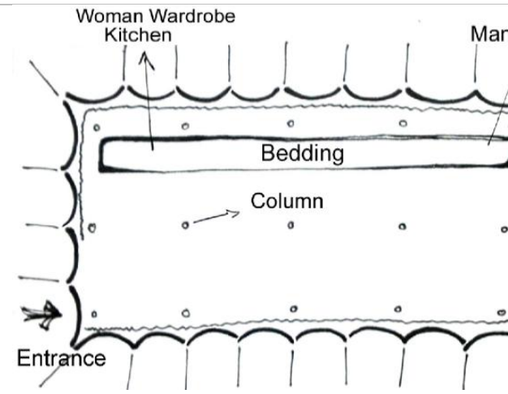
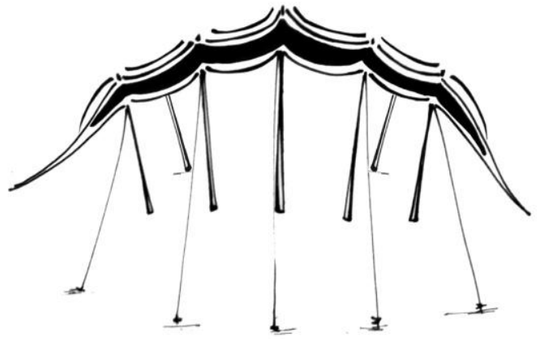
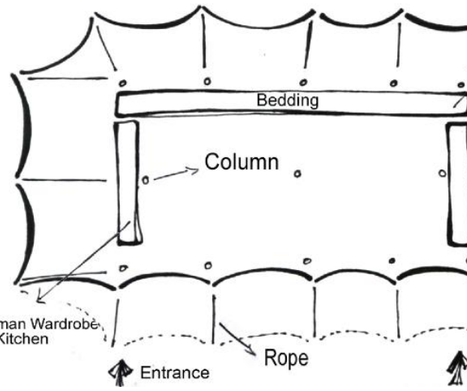
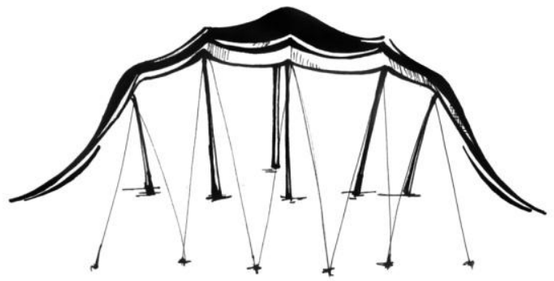
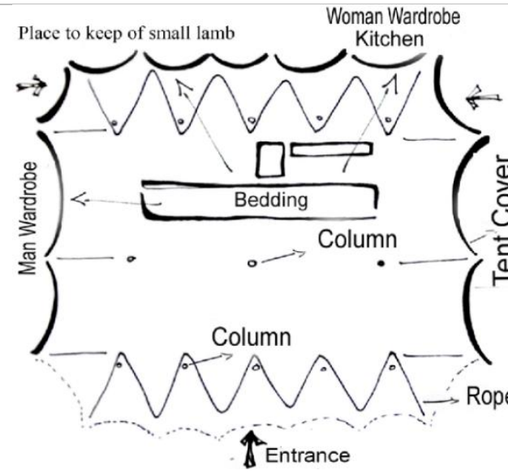
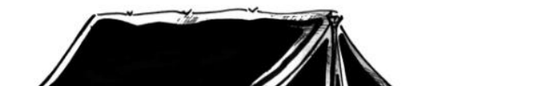
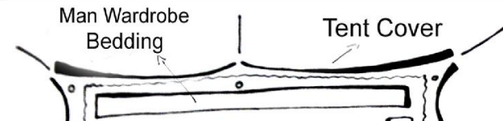
Fig. 126: Method of connection of the two strips of fabric by metal pins

Columns in Soleimani Tribe are taller than in the most of the tents of the other Iranian tribes. They reach 3 meters of height, the trunks are between 8 and 10 cm in diameter, due to good quality of timber accessible on their trail. Timber of young willows and poplars is knotfree and homogenous. Their tips are either naturally forked (trunk-bough junction) or get a dovetail incision to secure a ridge beam resting on them. Local name for the column is *kalak*. The piece of wood placed on the top of a forked tip, that encourages efficiency of knots, is called *tir*.
Posts that are encircling the tents are similar to the columns but shorter, to set a slope of the roof. All of them have dovetail incision on the tip to secure knots of the ropes.

Fig. 127:Soleimani Tribe. columns with a groove/forked end and placement of horizontal beams on them, photo by author

Table 21:The Black Tents Architecture – a comparison table

	Black Tent	Number of edge posts	Number of central posts	Number of ropes on roof	photo	Sketch	Plan
A.	**Tribe Qashqai in Fars Province**	**16**	**0**	**16**			
	Tribe Qashqai in Fars Province	**18**	**3**	**18**			
B.	**Tribe Arkovazi in Ilam Province**	**16**	**2**	**4**			

D.	**Tribe Garapapakhin Azarbayjan**	**12**	**3**	**24**			
E.	**Tribe Kormanj in Golestan Province**	**12**	**1**	**16**			
F.	**Tribe Bahlooli in Sistan Province**	**12**	**1**	**26**			
G.	**Tribe Soleimani**	**12**	**3**	**12**			

5 PROPERTIES AND LABORATORY TESTING OF THE BLACK TENT FABRIC

5.1 Properties of fabrics used in roof covers and wall shields of the Black Tents

5.1.1 Shearing goat's hair

In the nomadic households one-year-old goats are sheared with special scissors in the beginning of the summer. In comparison with the sheep, goats are more sensitive to cold weather,and they should grow their hair before the winter. The average amount of hair obtained from each goat is about half a kilo. Shearing takes place inside or outside a fenced corral and the animals are not hobbled, as it enough if someone holds goat by beard and it remains calm. Family members are collaborating while shearing, and if the herd is big or nomadic household cannot do the job for some reasons, the other men from the neighbourhood come to help.

Fig. 128: Shearing goat hair, photo by author

Fig. 129: Goat hair yarn, http://www.dana.ir/news/1184604.html/-

5.1.2 Preparing goat's hair

Cutting goats' hair is often done in groups, with the help of young people and under the guidance and management of middle-aged and elderly women. Then the hair is cleaned and washed. Everything is done with hands.After washing the hair is perfectly soft. These activities are done in groups as they demand much time and effort.

5.1.3 Spinning and preparing yarn from goats hair

At this stage women spinthe goat's hair yarn and make balls of it ready for further use. They do it with hands moistened with water. Then they prepare spindles for spinning. There are two kinds of spindles, the most popular consists of two horizontal,crosswise bars and a vertical stick, joined together.

Fig. 130: preparing yarn, photo by M, Kiani.

Fig. 131: preparing yarn,photo from movie (Grass,1925)

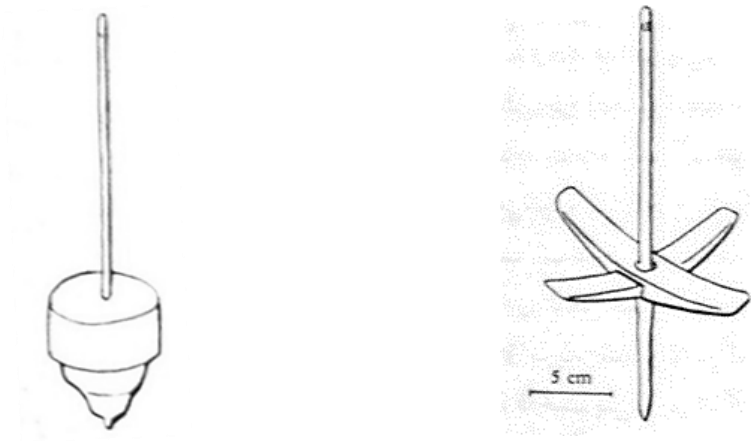


Fig. 132: Two kinds of spindle. Source: Filberg, 1980, P. 201

5.1.4 Weaving of the Black Tent fabric

Weaving the fabric does not need specific time, and in the summer, when people are less busy, women have the opportunity to do the work. They set up the “workshop” as a very simple loom, usually at the back of the tent in the nearest suitable place.

The workshop consists of 4 wooden pins, nailed to the ground. They support two horizontal end pins, between which warp isstretched. The length and width of the stripof fabric is set this way.Two parallel wooden sticks are passed between the yarns of warp allowing woof thread to pass between them. Woof is pressed with heavy metal combs to ensure the tightness of the fabric and its thickness. The strips of fabric are made one by one up to the required number. Then they are sawn together and ready to use as a roof cover or a tent wall.

Fig. 133: Weaving a strip of Black Tent by women of Ilam Province. Photo by Saeed Soroush, source: www.fars news agency

5.1.5 Rope nodes used by the tribes

The rope nodes are removable and adjustable. As the ropes are always connected to the hooks around the tent cover, their lengthmust be adapted (loosened or tightened) easily when it is needed.The following figure showsthe steps of a node preparation.

Fig. 134: In ropes mixture of goats' fleece and hair is used. Black colour comes from goats hair and white colour comes from fleece, photo by author Iranian goat: https://www.iga-goatworld.com/uploads/6/1/6/2/6162024/female-abadeh-cashmere-goat_orig.jpg

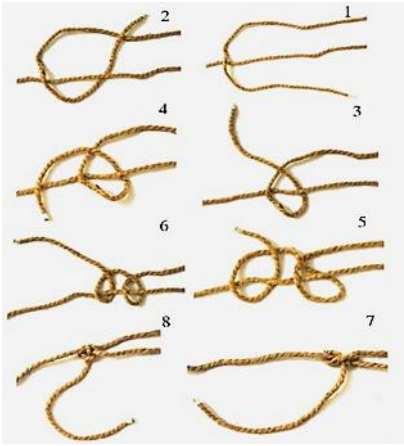


Fig. 135: The steps of making a node. Making a knot, by author

5.2 Laboratory quality control testing of the Black Tent fabric

According to the scientific publications[23] goats' hair is susceptible to the air humidity. It means that when moisture is high its diameter expands and in the hot and dry air it shrinks. For this reason, the pores of the fabric are closed in the rain and reopen in the heat. Closure of pores in the rainis supported by natural water repelling properties of goat's hair, which prevents entry of droplets of water inside. In warm weather pores open and allow air passage through the fabric. This is supported by summer structures of the tents, encouraging the airflow.

As goats' hair have high tensile strength, and for this reason, tent ropes can be tightened to withstand wind blows in extreme weather occurrences. The ropes are prepared by

[23] Kiani, M., 2006. Sarrafi Nik, A., 2011. Shojaei, A., Najib Nia, S., 2011.

hand and used accordingly to the expected loads they will bear while putting up the tents in spring or late in autumn.

Iranian goats' hair has dark colour; in the summer it gives good shadow, while the airflow under it removes radiation heat. In winter its darkness enhances radiation heat, which lingering under the roof acts as an insulator and blocks transmission of the inside temperature out helping to raise the temperature inside the tent.

The fabric of the tent is going to be evaluated by tests of quality for the first time ever. The tests and experiments will be limited to physical-mechanical field[24]. All the tests and experiments were carried out under the supervision of the author in the laboratory of the Textile Engineering Faculty, Isfahan University of Technology[25] with the help of a laboratory specialist.

The procedure of the experiment was as follows:[26]

- discussion on the quality test stating the targets and expected results,
- performing the test,
- comparison of the results
- Table **22**),
- analysis of the results of the experiment
- summarizing the results

The list of obligatory textile tests leading to obtaining presupposed results was as follows:

- material of warp and woof
- texture of fabric weave
- assessment of the fibre grade
- assessment of warp and woof grade
- warp and woof density
- unit weight of the textile per 1 sq.m
- strength to tear (damage) in the direction of the warp and woof
- length increase to tear (damage) in the direction of the warp
- air permeability and air velocity
- percentage of the returnable increase in the length of fabric for a given force
- recovered moisture contents
- measure and angle of bending in the direction of warp and woof.

5.3 Textile tests

The specimen of goat's hair fabric, from Qashqai tribe was tested in the laboratory Textile Engineering Faculty, Isfahan University of Technology in 2018. The texture of the specimen design was recognized as Taffeta[27] (simple).

---

[24]Collecting of the tests list under review of Dr. Shahin Khorsand.

[25]The tests were performed under protection of dr. Ghollamreza Afkhami, the Industral Responsible for the Textile Engineering Faculty, Isfahan University of Technology.

[26]Analyzed and checked the results under supervision of Eng. Mehdi Hejazi. Textile Engineering Faculty, Isfahan University of Technology.

[27] The most common and simple type of the fabric for this test made with goats hair yarn. Both sides of the fabric are the same in the texture and shape. (Hassas, N, 2012, p.86). This test was

Table 22:Physical characteristic of a sample of the specimen fabric, made of goats hair Qashqai tribe, which was tested in 2018. The tests were performed under supervision of eng. Mehri Sedighipour, Head of the Fiber Physics Laboratory of Textile Engineering Faculty, Isfahan University of Technology

Characteristic of sample		
Unit weight of the textile surface. (g/m²)	1588	
Air permeability. (ml/sec.cm²)100 Pa	76.77	
Warp density. (1/cm)	5	
Woof density. (1/cm)	2.3	
Recovered moisture in standard condition.%	12.78	
Recovered moisture in relative humidityof the environment. (40%)	3.75	
Strength of warp (N)	Average	151/87
	Standard deviation	23/62
	Coefficient of variation(%)	15/55
Strength of woof (N)	Average	157/3
	Standard deviation	24/66
	Coefficient of variation(%)	15/68
Length increase to tear in the direction of the warp (%)	Average	23/59
	Standard deviation	2/66
	Coefficient of variation(%)	11/28
Length increase to tear in the direction of the woof (%)	Average	2/87
	Standard deviation	0/32
	Coefficient of variation(%)	11/06
Bending in the direction of the warp (cm)	Average	3/62
	Standard deviation	0/59
	Coefficient of variation(%)	16/42
Bending in the direction of the woof (cm)	Average	3/56
	Standard deviation	0/66
	Coefficient of variation(%)	18/45
Warp grade (Metric)	Average	0.78
	Standard deviation	0.061
	Coefficient of variation(%)	7.79
Woof grade (Metric)	Average	0.41
	Standard deviation	0.02
	Coefficient of variation(%)	4.97
Warp fiber diameter(μ)	Average	79.96
	Standard deviation	19.31
	Coefficient of variation(%)	24.15
Woof fiber diameter (μ)	Average	78.16
	Standard deviation	18.30
	Coefficient of variation(%)	23.42

conducted under supervision of Eng. A, Tabibi and Eng. K, Matin, responsible for the fiber identification laboratory, Textile Engineering Faculty,Isfahan University of Technology.

The results of the following charts are included in the Table 22. They show the properties of the fabric indicating its flexibility and pliability which is important for the covers that are folded and unfolded many times and arranged in different ways throughout the seasons. Two, most possible loads were examined: N 80 and N 100.

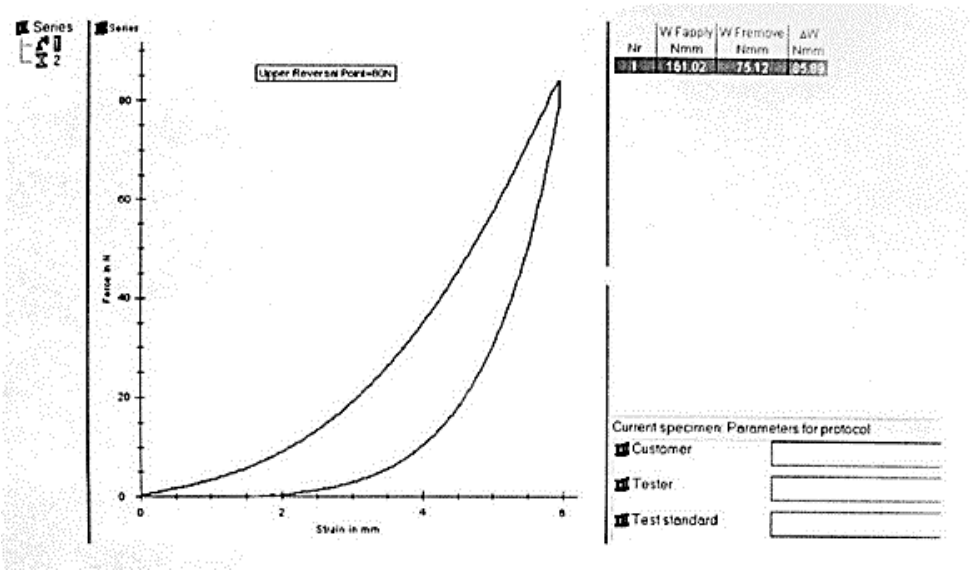


Fig. 136: Sample hysteresis curve in the direction of the wrap (N 80)

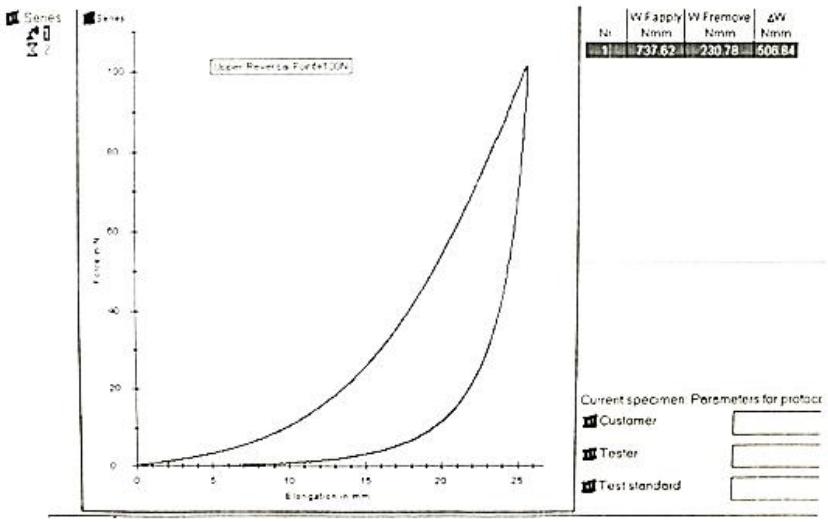


Fig. 137: Sample hysteresis curve in the direction of the warp (N 100)

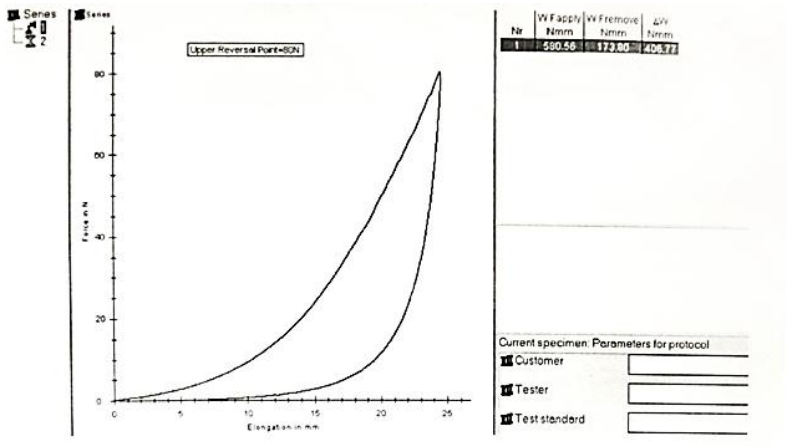


Fig. 138: Sample hysteresis curve in the direction of the woof (N 80)

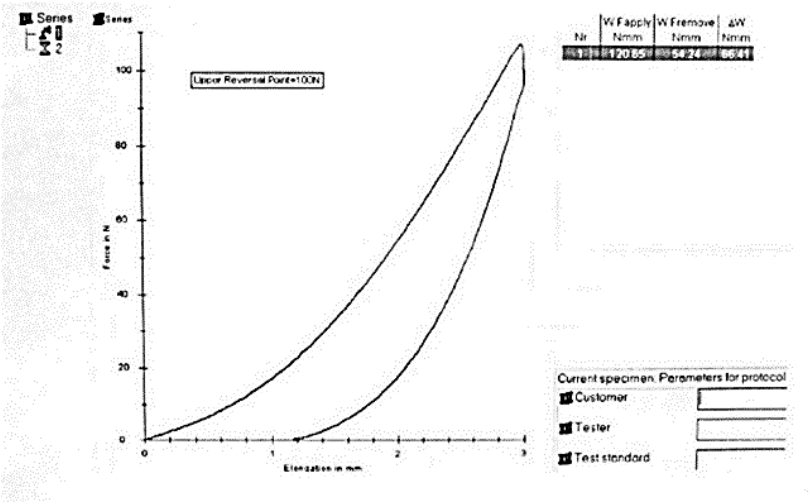


Fig. 139: Sample hysteresis curve in the direction of the woof (N 100)

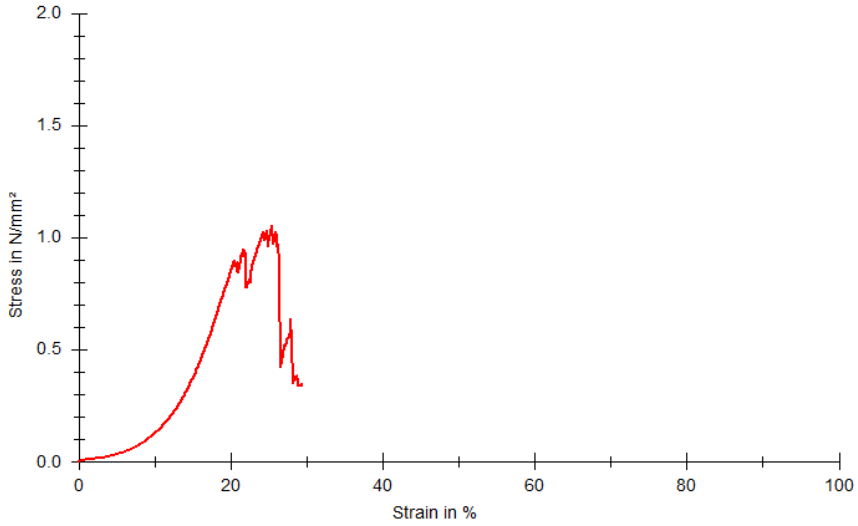


Fig. 140:Stress and strain diagram in the direction of the warp

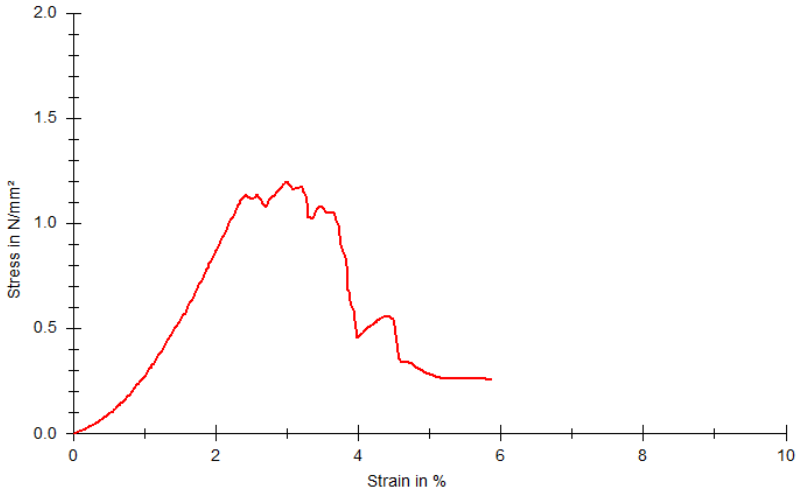


Fig. 141:Stress and strain diagram in the direction of the woofStress[28] and strain[29] diagrams are one of the graphical representation of stress-strain relationship that is obtained by loading of the bodies and measuring the deformation throughout the tensile test.

5.4 Analysis of the textile experiments

5.4.1 Strength and strain of the fabric

5.4.1.1 Description of the test

5.4.1.2 The test result

The results of tear force in terms of Newton (N) and relative lengthening (mm) are reported in percent (%). Each of these parameters has been reported separately along the warp and woof directions. Average parameters, standard deviation and coefficient of variation are the components of the machine's calculations (
Table **22**).
Here “n” is the sample number (there were le number was 5) and the reported numbers of each experiment are obtained for the directions of the warp and woof separately. The rupture power (tear strength) is a force with which the fabric is torn. Avarage parameter ($\bar{x}$) and standard deviation (σ) are derived from the following formulas:

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n} \qquad \sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{x})^2}.$$

In the case of
Table **22**the result is obtained from the average fabric strength, it should be said that this ratio (between 160-150 Newton) is classified as a component of the average range

[28] The amount of internal pressure on the stress unit. (Hassas, N, 2012, p.88)
[29] The strain in the physics term, it refers to the change of length in each direction of a solid object that occurs due to the force (stress) in relation to the dimensions of that object before the application of the force.(Hassas, N, 2012, p.88)

of fabrics in terms of strength. It should be noted that the strength in the direction of the woof is slightly higher than direction of the wrap, due to the fact that the woof threads are twins of the same category; so the thickness of the woof is bigger.
Increase of the length of rupture.
Table **22**, Fig. 137andFig. 138) was obtained by dividing the length of fabric in direction of the warp or woof in its tearing point by its initial length. It has been reported that increase in the length has grown to 23% in the direction of the warp. This amount is considered normal for the fabrics used for tents. In the woof direction it was 2.87%, and this result is reported as too small for tents' fabric.
The hysteresis curves (force-elongation factor) in the direction of the warp and woof were automatically drawn while performing the test. The force changes from zero Newton to the defined maximum force that will not tear up the fabric sample. This force is known from the previous experiment (the rupture test). Then this force is gradually reduced to zero (Fig. 136 - Fig. 139).
In the hysteresis curve, the values shown on horizontal axis indicate initial situation (0/0) and the return value after the experiment, which differs. This value shows ability of the fabric to return to its previous length after the force is appliedand removed. The nomad tents are exposed to various loads and their covers must be also resistant to tensile forces. Limited deformations mean pliability of the fabric.
According to the hysteresis curve in the direction of warp and woof maximum forces were 80 N and 100 N. The table at the top-right side of each chart (Fig. 136 - Fig. 139) represents the work done, which is obtained by multiplying the force applied by the increase of the length of the fabric (WFapply Nm/m). The second column of this table indicates the loading while decreasing the force (WFremove Nm/m), and the third column shows the difference between these two values (ΔW).
If a differenceon the chartfor the **direction of warp** indicates about 7 mm the deformation which reached 25 mm is non-returnable. This means that elongation above28% of the specimen is irreversible. Therefore,18 mm of 25 mm increase in length(72%) would shrink back. This indicates that application of average forces to the tent fabric results in relatively large, irreversible deformations.
In **the woof direction** the hysteresis curve distance is about 2 mm in comparison with 6 mm elongation. This means that 33% elongation of the specimen is irreversible. The fabric is about 67% reversible in the woof direction.

5.4.2 Unit weight of the fabric

5.4.2.1 Description of the experiment

According to the standard, five circular samples of different lots (bales) are cut by a cutter and the weight of a square meter of then is read. The device used in the test is D3776-96with the ASTM standard.The weight of square meter of the fabric is read directly from the device. The machine, called square meter balance consists of a graded bow with a metal tab and a pointer. If a sample of 100 sq centimeters in size, according to the guidelines of the experiment, is fixed to the ring, the number indicated by a needle on the scale shows the square meter weight of the fabric.

Fig. 142: The view of square meter balance device, used for measuring in thelaboratory photo by author

5.4.2.2 The test result

The weight of the square meter of the fabric depends on the density and grade of the yarns forming it and is obtained from the following formula:

{(warp grade compression × warp score by tex /10) + (woof grade compression × woof score by tex /10) = Fabric weight}

The sample weight is 1588 g/m^2, which places it in the group of very heavy texture fabrics. It is very hard to wear but using it for a tent would be suitable. Basically, fabrics with 130 grams per sq/m are qualified in the middle group of weights, and all above this value belong to a heavy group of products.

5.4.3 Density of warp and woof yarns

5.4.3.1 Description of the experiment

To measure density of warp and woof threadsthere is one-half inch or one-inch magnifying glass or lacquer dials needed. The number of threads obtained by counting with the help of magnifying glass, which is made by eye, is not accurate and entails errors. Density measured with the help of lacquer numerals that have diagonal lines of convergence enables precise pinpointingof the density.It is carried out by placing diagonal lines in the direction of the desired threads. The lozenge is found by shaking of the device on the fabric, then head of the lozenge shows the density number per square centimeter. Three tests for warp yarns and three for woof yarns in the different parts of the fabric were done randomly and the average results were reported.

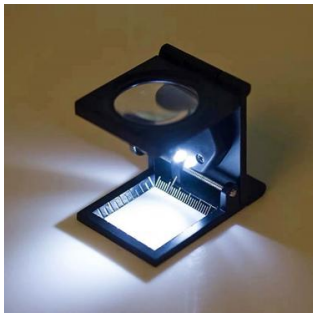


Fig. 143:The view of density measuring device and view of its magnifier,photo: www.aliexpress.com/item/1000001258889.html

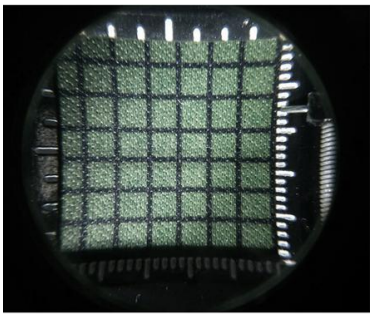


Fig. 144:The view of its magnifier, photo: www.aliexpress.com/item/1000001258889.html

5.4.3.2 The test result

The results for the density of warp and woof for the tent cover of the Black Tent from Qashqai tribe are reported to be 5 and 2.3 per cm respectively. The reported densities are very low because of the thickness of the threads of the warp and woof. Such threads are too thick for weaving on contemporary weaving looms. As this fabric is woven manually by the tribeswomen, the thickness of the threads is not an obstacle, on the contrary, it helps to regulate temperatures in the tents.

5.4.4 Score (grade) of warp and woof

5.4.4.1 Description of the experiment

This test is done by using a metering method and then weighing. At first the curls and waves of the fabric threads must be removed. To do this, the strands are hung on a hook more than one meter high and at the bottom they are loaded with a weight of 1 to 5 Newton per centimetre N/CM.

The yarn is cut to a certain length, weighed on the scale, then by performing the required calculations, the Nm score/metric number is obtained following formula:

{*yarn length in meters / Yarn weight in grams = yarn metric score}*

Fig. 145:Place of hanging yarn from the hook, digital scale with 4 decimal places for weighing yarns,laboratory photo by author

5.4.4.2 The test result

The numbers obtained for the metric scores of the wrap and woof, are respectively 0.78 NM and 0.41 NM (Table 22). Therefore, the warp yarn has higher density and more delicate. The woof yarn, which has lower density and thicker. The two values obtained for scoring warp and woof threads represent the thickness of the fabric fibers, which is formed from the goat's hair so it is suitable for weaving the tent fabric.

5.4.5 Diameter of the fiber

5.4.5.1 Description of the experiment

One of the testing methods to determine the thickness of a fibre is to measure the diameter of a circular cross-section using a microscope. By using this technique, the fineness of the fibre, depending on different kinds of goats' hair can be determined.

The microscope is graded and to read fiber diameters 400x magnification is usually used. Before measuring the diameter, the graduated eye of a microscope must be calibrated

after which its correction coefficient is obtained. For this purpose calibrated glass is placed under the microscope. If the distance between the lines on a calibrated glass scale is 0.05 mm and magnification is equal 400, this distance should be equal to 20 mm on a graded eye, and thus the obtained coefficient is correct.
Fibre sampling was carried out in accordance with existing standards. A bundle of fibres is cut by a microtome into approximately into 0.25 mm thick slices. A drop of oil, such as glycerine, is poured onto the glass and the fibres are gently put over this drop and then the diameter of the fibre is read by the microscope.

5.4.5.2 The test result

The goat's hair fiber diameter for warp and woof is between 78-80 micrometers which indicates very high thickness of this fiber. The higher fiber thickness results in a thicker yarn. Therefore, the goat hair fabric is hard and stiff and the tent cover has better durability which contributes to the tents stability.

5.4.6 Flexibility of fabric - flexural length

5.4.6.1 Description of the experiment

Equipment used: a device measuring standard flexibility of fabric is in accordance with the BS 3356.
Its horizontal base has two attached vertical panels and between them a separate pane placed at an angle of 41.5 degrees to the base is mounted. Horizontal part of the device is ruler graded, which allows to read the length of the fabric that bends under its own weight (L). The bending length (C) is half of the length of the fabric which bends under its own weight.

C=L× F(Θ) where **F(Θ)=**$\frac{COS\theta/2}{8TAN\theta}\forall\boldsymbol{\theta} = \mathbf{41/5°}$**→ F(Θ)=O.5→C=**$\frac{L}{2}$

Three samples were measured in the direction of wrap and three in the direction of woof, each 1x6 inch long. The sample was placed on a flat surface under the ruler, then the ruler was moved from the edge of the fabric surface and pushed lightly forward to see growing curvature of the sample on the diagonal line on the mirror. This length will be twice the flexural length.

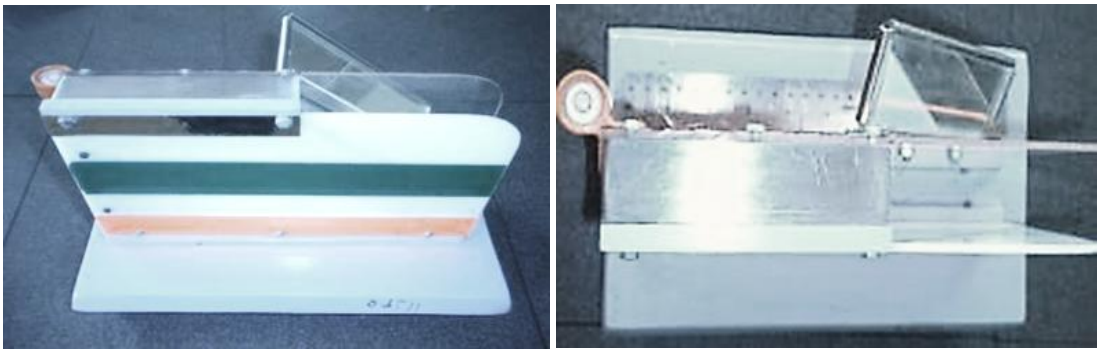


Fig. 146: View of the device. Its graded ruler and mirror to read the measuring bending length of a fabric, aboratory photo by author

Fig. 147: Schematic Diagram of Bending Test according to BS 3356-1990 Standard Method,http://www.tjprc.org/publishpapers/2-29-1535005850-1IJTFTOCT20181.pdf

5.4.6.2 The test result

The bending length obtained in this test for warp and woof is 3.62 cm for warp and 3.26 cm for woof. The warp is more delicate and it is the reason of its greater flexural length. Generally, the values obtained for the bending length are high, which means that the fabric is not flexible and similarily durable in both directions. This quality contributes to the tents stability while they are set. The result confirms also that the fabric can withstand seasonal dismantling and mounting of the tents for a long time.

5.4.7 Moisture absorption of the fibers

5.4.7.1 Description of experiment

In this test the condition cabin that controls temperature and internal humidity has been used. The cabin is equipped with a temperature regulator, humidifier and temperature and humidity sensors. The cabin is monitored and can provide all the climatic settings of temperature and humidity.

Fig. 148:Conditions box, location of samples,laboratory photo by author

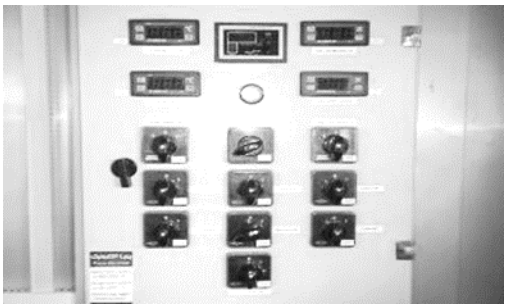


Fig. 149:Monitor and standard chassis setting keys,laboratory photo by author

The fabric sample was cut into 12 x 12 cm squares and placed in the cabin in the relative humidity of 65 ± 5 % and 22 ± 2°C temperature, and remained in these conditions for 24 hours. Then, immediately after removal from the cabin the squares were weighed. They was transferred into an oven, where they dried for 20 minutes. Then the sample was taken out and weighed. This was repeated until the weights were stable. The ratio of water weight to dry weight of each sample gave the reported ratio of the capacity to absorb water by the fabric.

Fig. 150:View of a laboratory oven with set parameters for the samples drying,Laboratory photo by author

5.4.7.2 The test result

Moisture absorption of the fibres is moderate and it is reported as 12.78% in standard laboratory conditions of 65% humidity. In reality, in environmental conditions with average 40% humidity it goes down to 7.35%. The reported range in both: standard and environmental conditions is less than the corresponding values for wool fibres.
The higher moisture absorption is, the cooler is the fabric in the warmer season, which leads to more comfortable interior under it. Generally, the woollen fabrics made of goat hair have a good thermal effect, making them also suitable for hot seasons. So this is a positive point for the nomads'tents.

5.4.8 Air permeability

5.4.8.1 Description of the experiment

Air injection/penetration measuring device includes a manometer to control pressure generated by the valves. The pressure varies between 100 Pa (Pascal) and 2 kPa. This device has 4 flowmeters, which, depending on the permeability of the fabric, are used. Flowmeter 1 or 2 is used with the pressure control valve "B", while the flowmeters of 3 or 4 are used, the setting valve "C" is used.
$R=qv/A \times 100$ is the formula for the airflow, where (R) is the airflow in ml/(sec×cm^2), (qv) is the average flow measured in ml/sec, and (A) is the level of the test. Standard of the machine is in accordance with EN ISO 9237 or BS 5636: 1990.

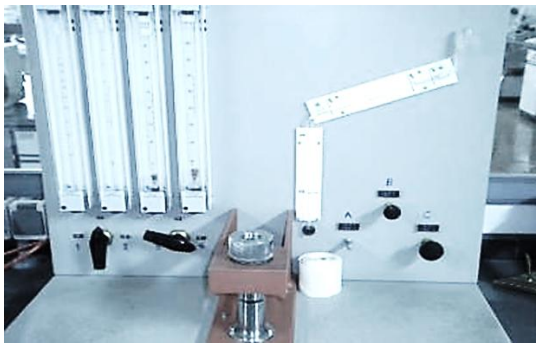


Fig. 151:Air permeability device, laboratory photo by author

Five samples were tested, and then the average results were taken from each test. The surface is 508 mm2. The reading from the flowmeter was in ml/sec, which is calculated according to aforementioned formula. Due to the type of the fabrics, flowmeters 3 and 4 were used, so the adjustment valve (C) was used. At a pressure of 100 Pascal, the test was performed and reported.

5.4.8.2 The test result

The reported air permeability value was 77.76, that is very low value for air permeability. The reason for this is the way of hand spinning (twisting) the yarns of warp and woof. It results in a low density of warp and woof threads. This increases the diameter of the yarns, so the airflow is reduced, which in case of the tents is a very positive point.

5.4.9 Ventilation of Black Tents

The goat's hair has dark colour which gives shadow inside the tents in summer. The same colour in winter cumulates insolation and helps to keep higher temperature inside the tents. Therefore, regulation of the temperature and ventilation and use of solar energy are provided in a simple and vernacular, but efficient way.

The temperature inside the tents in winter and summer is comfortable for people and allows living in cold and in hot weather. Furthermore, summer constructions force air circulation by means of pitched roofs allowing hot air to gather and escape from the tents, so the temperature inside remains stable and not too hot.

In Fars Province, Qashqai tribe winter and summer Black Tents have different layouts. In winter the entrance of a tent is smaller than summer one. Winter tent is build with a low, sloping roof as this helps to keep higher temperature inside, while in summer the tent has high-pitched roof for better ventilation. There are many other small differences between winter and summer construction of the tents, as the different tribes have summer and winter temperatures different from that of Qashqai Tribe. However, the other tribes have not completely different tent structures for summer and winter, differences are restricted to the layout of the interiors and way of entering the tents. In some cases the tribe stays in village houses in winters.

5.5 Summary: adjustment of fabric of Iranian Black Tents to the local conditions

Tent covers are made of goat hair. The score of warp and woof thread of Black Tent weave[30]is between 0.78 and 0.41 NM. The warp and woof density in 1 cm of fabric are 5 and 2.3 respectively.

For example, if 100 meters of thread is estimated to weigh 5 grams, dividing 100 by 5 gives the number 20. The thread score is 20. This calculation shows the higher is the thread score the smaller is its thickness. That is, a thread with a score of 10 is thicker than the same thread with a score of 20 (https://rochi.ir/mag/%D9%86%D9%85%D8%B1%D9%87-%D9%86%D8%AE/).

[30] Yarn for roof or wall weave, both of them are the same.

As it was mentioned in the yarn weight, density and grade tests scores are inversely related to the delicacy of the fiber. When the fiber score and density is higher, the delicacy is lower. In the goats hair fabric the warp has higher scores but is more delicate than woof.

The Black Tent fabric is characterised by a balance in both warp and weft direction when parameters of the fabric are concerned (Hassas, N, 2012, p.86). In different provinces fabrics in Black Tents are the same, according to initial author's research.

Fabric strength is between 150-160 N. This classifies it as middle-range fabric in terms of strength. The index of elastic and plastic reaction in this fabric is as follows: in the warp direction it is irreversible in about 28%, so about 72% of its elongation is reversible, in the woof direction about 33% of elongation is irreversible which means that about 67% is reversible. Therefore, the fabric shows relatively big reversible deformation. Due to these properties of the fabric it can be used for a very long time.

Natural fibers made of animal hair absorb moisture. The research of Black Tent fabric carried out by the authoris between 7% and 35%. As these numbers are relatively low, the weight of fabric does not increase much, which has positive effect on construction of the tents. Goat hair are particularly elastic and have outstanding protective qualities as humidity protectors. When the weather is cold and humidity high the weave is tight. In warm season, pores of the fabric and spaces between the fibers open and allow air to circulate.

6 ANALYSIS AND TYPOLOGY OF BLACK TENTS STRUCTURE BUILT BY THE CHOSEN IRANIAN NOMAD TRIBES

Tent is a tensile shell that is supported by a column or an arch. Nomads' tent is a specific kind of cable structure with double curvature and its roof surface is covered by a continuous covermade of strips of woollen fabric.

Fabric covers require pressed and bending elements to keep them upright and transmit their load to the ground. The tent's shellis carrying a part of the loads. Nomadic tents are covered entirely with fabric are kept upright by the central row of columns and side pillars.

Cables are important elements of tensile fabric structures as they play vital role in the stability, resistance to loads and shape of the structures. The Black Tents' ropes are made of goats hair or sometimes hair mixed with wool and act as structural cables.

After reviewing a number of Black Tents in various climatic areas of Iran,author obtained data pertaining to their resemblances and differences. This allows to arrive at comprehensive results concerning structural behaviour of the Black Tent. All experiments werecarried out on the models built for the Black Tents from Fars Province. They cover wind, rain and snow loads. The results include stress-strain rates and displacements under various loads. These results are compared with the other types of structures of the Black Tents, that encounter different weather conditions due to different trails of Iranian tribes.

6.1 Modeling of the Black Tent fabric[31]

In modeling for civil engineering structures the software like Robot, Etub, Sap and Ansys programmes are used for structural load analysis. Due to the complexity in the case of structural behaviour of the tent shell, not each of them was suitable. Thus, after conducted survey, Abacus programme proved to have the potential in this kind of modelling.

The first step was a simulation of the fabric of a Black Tent. Due to the tests carried out on the samples of the fabrics presented on the Fig. 140 and Fig. 141 in the chapter 5.3. It was confirmed that the fabric warp and woof stress and strain reaction is non-linear and that it should follow non-elastic materials in modelling software, in order to secure consistency of the results of the simulation with the reality.

One of the most important mechanical properties is tensile strength. The simplest scientific method to study its features is to examine the reactions against imposed forces and the consequences of the transformation. The above mentioned tests were derived from them. In order to obtain the approximate elasticity modulus, the diagram of fabric stress-strain value was used. During extension it was computed approximate slope line between load imposing moments to maximum load moment before plasticity mode of the material starts.

[31] The analysis and modeling was done under supervision of Dr. Mohammad Kojouri (PDENG Mechanics, University of Twente, Netherland)

Thus, the modulus of elasticity is obtained according to the following formula wasderived by dividing the value of tensile stress by the value of strain in the warp direction:

$$E_{11} = \frac{\sigma}{\varepsilon} \approx \frac{0.95 \times 10^6}{20\%} = 4.75 \times 10^6 \, pa = 4.75 Mpa$$

The elasticity module along the woof direction is:

$$E_{22} = \frac{\sigma}{\varepsilon} \approx \frac{1.15 \times 10^6}{2.5\%} = 46 \times 10^6 \, pa = 46 Mpa$$

The absolute ratio value of the transverse strain to the longitudinal strain, to honour French mathematician, is called Poisson's ratio. Various experiments carried out on different materials showed that Poisson's ratio value for various materials change in the range between 0.25 to 0.35. The higher modes of 0.1 for concrete and lower modes of 0.5 for elastic materials like rubber are obtained, (Popov, E.P., 1952. P. 34, Shibo, R., 2008. P. 68). The way to obtain the coefficient visually is to paint a circle on the fabric before a load is imposed and based on a diameter of it. The change ratio along warp to the change ratio along woof shows the fabric's Poisson's ratio.

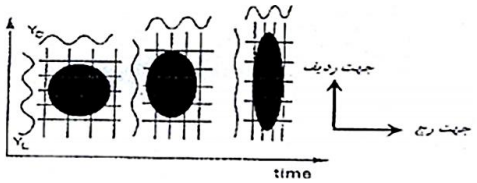


Fig. 152: Schematic view of the deformation of fabric under tension and the circle drawn on it to determine the approximate Poisson's ratio, source: Badri, K., Karimi, H., Asgharian, A., 2008, p.56

It should be noted that for many materials, linear elastic model could not show the material behaviour accurately. One of the best examples of this type is rubber material, in which non-linear relationship between stress and strain occurs. It is isotropic, incompressible and in general independent of the strain rate.

Sampled Hyper elastic model is a proper way to show reactions of such materials. So for modeling of the Black tent fabric with the assumption of the same warp and woof yarn in the fabric (the isotropic model), a hyper-elastic model should be used. Based on the above mentioned data acquired in the analysis of fabric structure of the Black tents hyper-elastic model will be applied as follows, (ABAQUS/CAE user's guide, 22.5.1. Hyper elastic behaviour of rubberlike materials.):

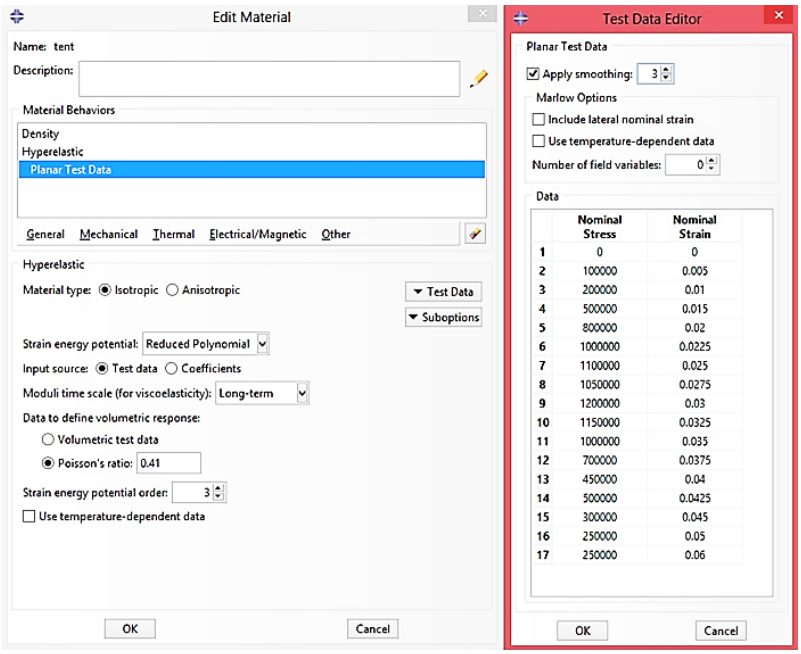


Fig. 153:Edit Material Chart, source: ABAQUS/CAE user's guide, 22.5.1.Hyper elastic behaviour of rubberlike materials

Multiple methods of modelling are proposed for soft and brittle materials. They are based on material qualities and the important issue is the point of breakage. Breakage is not only seen as shattering of material into pieces but it is also seen as permanent deformation of material and interruption of efficiency and functioning of it. One method applied to soft materials is distortion energy method (Van-Mises theory or Shear energy). According to this theory, the breakage occurs when the distortion energy of each element is equal or greater than distortion energy for tensile or compressive energy of the material. In the other words, the piece exhaustion occurs when the Van-Mises stress is more or equal to the yield point resistance ($\sigma_f \geq S_y$),(Popov, E.P., 1952, P. 71).

By definition, (σ_f) stands for von Mises stress; the three-dimensional load is defined as follows, (Popov, E.P., 1952. p. 72):

$$\sigma_f = \frac{\sqrt{2}}{2}\left[(\sigma_x - \sigma_y)^2 + (\sigma_x - \sigma_z)^2 + (\sigma_y - \sigma_z)^2 + 6(\tau_{xy}^2 + \tau_{xz}^2 + \tau_{yz}^2)\right]^{\frac{1}{2}}$$

Where $\sigma_x, \sigma_y, \sigma_z$ are normal tensions and $\tau_{xy} + \tau_{xz} + \tau_{yz}$ are shear stresses in three directions. So it might be said that von-Mises stress is a stress equivalent to 3 normal stresses and 3 shear stresses imposed on an element of material. This means that instead of analysing each of the six stresses one may use an equivalent stress to clarify "piece breakage" point or safety factor of the "pieces".

Thickness of the Black Tent fabric the is very small in comparison with its length and width, so the tensile test done on the fabric can be considered as a planar test. In this test, planar deformation mode is expressed as follows. (ABAQUS/CAE user's guide, 22.5.1. Hyper elastic behavior of rubberlike materials.)

$$F=\begin{bmatrix}\lambda_1 & 0 & 0\\ 0 & \lambda_2 & 0\\ 0 & 0 & \lambda_3\end{bmatrix},\ \lambda_1=\lambda_S,\ \lambda_2=1,\ \lambda_3=1/\lambda_S$$

The λ_S in this formula, represents the amount of tension in the load direction.

Overall, in the planar tensions, according to the Hooke's law of elasticity states that the relationship between the amount of tensile stresses in two main directions σ_{11}, σ_{22} and shear stress σ_{12} by elasticity modulus E, Poisson's ratio ν and strain in two main directions $\varepsilon_{11}, \varepsilon_{22}$ and shear strain states ε_{12}, can be demonstrated as follows, (Popov, E.P., 1952, p. 72):

$$\begin{bmatrix}\sigma_{11}\\ \sigma_{22}\\ \sigma_{12}\end{bmatrix}=\frac{E}{1-\nu^2}\begin{bmatrix}1 & \nu & 0\\ \nu & 1 & 0\\ 0 & 0 & \dfrac{1-\nu}{2}\end{bmatrix}\begin{bmatrix}\varepsilon_{11}\\ \varepsilon_{22}\\ 2\varepsilon_{12}\end{bmatrix}$$

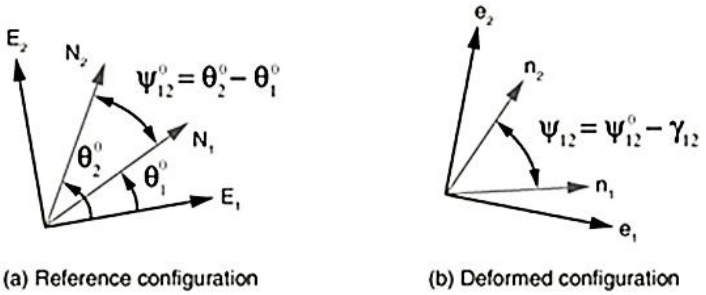
Sometimes experimental tests suffer noise and interference blurs resulting in a reading error. In Abacus software, the leveler method, based on Savitzy-Golay method was used to decrease possible noises and errors, (ABAQUS/CAE user's guide, 22.5.1. Hyper elastic behavior of rubberlike materials.).

It must be noted that the fabric made of two different kinds warp and woof is non-linear, non-elastic and non-isotropic. Therefore, non-linear reactions result from several important factors such as:non-linear warp and weft response separately, change and decrease of the warp and woof waves under the applied tensile load, contact and friction between warp and woof.

In general, fabrics show high stiffness under tension along their fibers, also, due to plane shear deformation, the fibers exit from their main direction and slightly rotate. Another point that must be considered is that the program can ignore fabric stiffness during planar bending and compression of fabric. So when more accurate fabric modelling is important, it is safer to use hyper-elastic model, which gives fuller version of the fabric.

The model intended for textile fabric is in ABAQUS software. In this model, main stress model T for fabric is converted into Cauchy stress σ. The connection between Cauchy stress and main stress associated the main strain of the fabric, main tension, and Cauchy stress together. J is Volumetric Jacobian, (ABAQUS/CAE user's guide, 23.4.1. Fabric material behavior).

$$J\sigma=\lambda_1 T_{11}\mathbf{n_1}\mathbf{n_1}+\lambda_2 T_{22}\mathbf{n_2}\mathbf{n_2}+T_{12}\csc(\psi_{12})(\mathbf{n_1}\mathbf{n_2}+\mathbf{n_2}\mathbf{n_1})-T_{12}\cot(\psi_{12})(\mathbf{n_1}\mathbf{n_1}+\mathbf{n_2}\mathbf{n_2}),$$



(a) Reference configuration (b) Deformed configuration

Fig. 154:Directional vectors before and after the stress test on a fabric, (ABAQUS/CAE user's guide, 23.4.1. Fabric material behavior)

It must noted that it is impossible to insert fabric profile like other material profile in abacus software graphic plate as the programme must be provided with the software coding system. The software program is written with the fabric profile is as follows:

```
*Material, name=tent
    *Density
    19860.,
    *Damping, Beta=1.e-6
*Fabric, stress free initial slack=yes
*Uniaxial, Component=1
*Loading data, regularize=off
     0.,      0.
  100000.,  0.005
  200000.,   0.01
  500000.,  0.015
  800000.,   0.02
    1e+06, 0.0225
  1.1e+06,  0.025
 1.05e+06, 0.0275
  1.2e+06,   0.03
 1.15e+06, 0.0325
    1e+06,  0.035
  700000., 0.0375
  450000.,   0.04
  500000., 0.0425
  300000.,  0.045
  250000.,   0.05
  250000.,   0.06
*Uniaxial, Component=2
*Loading data, regularize=off
  0.,      0.
   50000,  0.05
  100000,  0.1
  200000,  0.125
  300000,  0.15
  600000,  0.175
  900000,  0.2
  800000,  0.225
 1050000,  0.25
  500000., 0.275
  300000., 0.3
*Uniaxial, Component=shear
*Loading data, regularize=off
    0.,      0.
  500000,  0.1
 1000000,  0.2
**
```

Written data inserted in this programme is extracted from the fabric stress-strain diagram along warp and woof, which was mentioned before. Fabric shear, stress and strain result is obtained based on the following test. The shear strain γ obtained from the changes of angle between fabric fibers, (ABAQUS/CAE user's guide, 23.4.1. Fabric material behavior):

$$\gamma_{12} = \Psi_{12}^{0} - \Psi_{12}$$

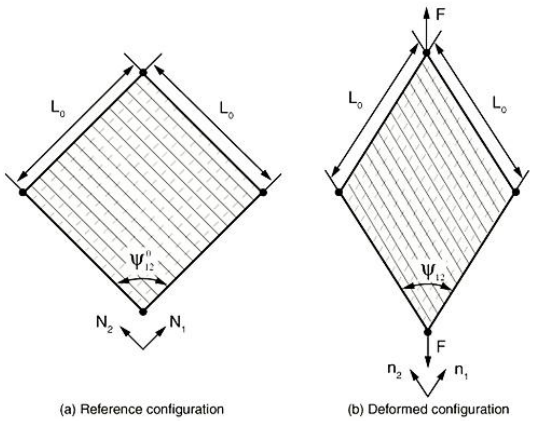


Fig. 155:Change of the the angle between the textile fabric vectors in the test determine the fabric shear strain (ABAQUS/CAE user's guide, 23.4.1. Fabric material behavior)

The modeling of tent fabric surface is done through as the mesh or network. One of the suitable elements for meshing of the Black Tent fabric in using the hyperelastic model is ***4-node doubly curved thick*** shell. It isone of the elements of SHELL family.

6.2 Method ofthe Tent structure modeling[32]

Main structure of the tent includes wooden structure (such as columns, ridge carrier beam and post), ropes and wooden stakes. Firstly, the structure is modeled in solidworks software and then inserted the model in Abacus software and the other piece of the structure as fabric is modeled in these software as SHELL.

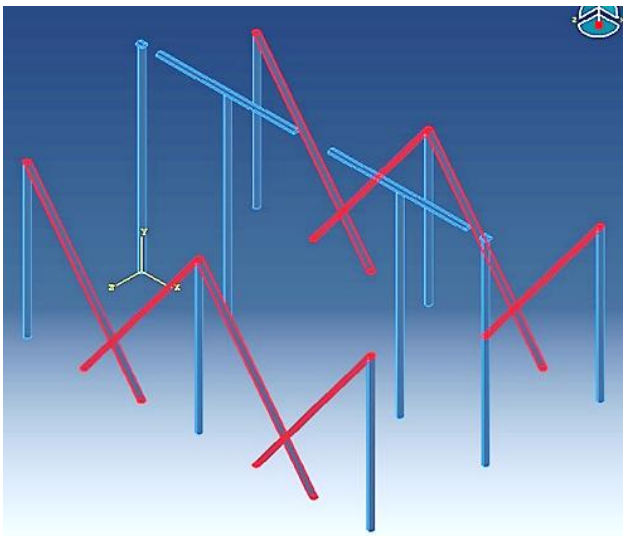


Fig. 156: Wooden beams and posts of the Black tent modeled in the SOLIDWORKS software and then sent to the ABAQUS software, model by author

Table 23:Density, elasticity modulus and Poisson's ratio of all materials applied to this structure are included in following table:

	Material	Type of elements	Method of modeling	Poisson`s ratio	Elasticity module (pa)	Density (Kgm/m³)
1	Wood	8-node linear brick (3D stress family)	Solid-Homogenous	0.3	11e9	500kgm
2	Rope	2-node linear 3D truss(Truss family)	Wire-truss	0.3	0.9e6	300kgm
3	Black tent fabric	4-node doubly curved thick shell (Shell family)	Shell-Homogenous	0.41	Planar test data	1.588 kgm
		4-node quadrilateral membrane(membrane family)	Membrane Fabric	0.41	Test data	

It should be noted that total weight of the Black Tent of Qashqai tribe is only 314 kg.

[32] The analysis and modeling was done under review of Dr. Mohammad Kojouri (PDENG Mechanics, University of Twente, Netherland)

6.3 Mesh networking of the Black Tent model

In order to represent precisely mesh model in Abacus software, it is correct to made every element separately and then mesh them. Therefore, model of the Black Tent structure meshing was performed as follows:

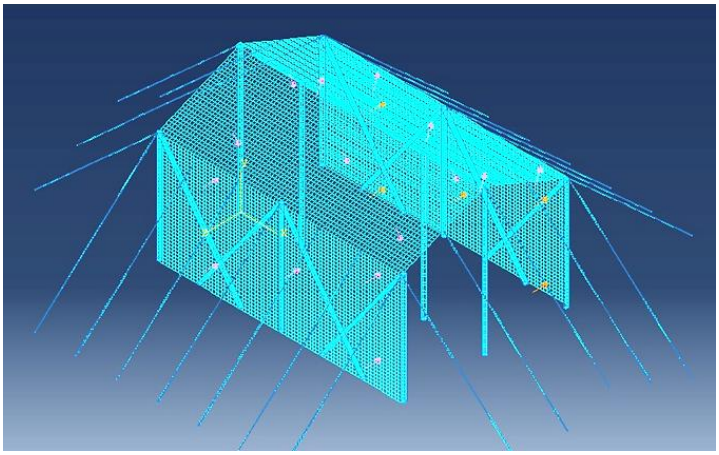


Fig. 157: Meshing all parts of a Black Tent model, model by author

6.4 Exert loads to the Black Tent

The most important required information in modeling concerns the loads imposed on the structures. Imposing loads is clearly marked in the Iranian Building codes and standards, Standards No, 2800[33].

Imposing loads to the Black Tent structure includes three factors. First, the imposing of the tent structure (Dead Load). Then, the initial stress caused by the tesion of holder ropes used for the tent stability (Live Load). Finally, rain and snow imposed, such as Gravity load and the lateral loads caused by wind on these structures. For loads like wind (lateral load), the most critical mode must be determined and imposed on the structure. This critical mode is considered because of low weight of tent, vast loading area of the tent exposed against the wind and freedom to move the bottom of the tent wall fabric's.

6.4.1 Initial tension in the holder ropes

In Abacus software, there is a part called *pre-defined field*, which is used to assess the initial load imposed on structure and the part which undergoes tension and compression. In order to compute initial tension rate in a rope, it was supposed to calculate that in the end of all ropes on the ground attached a 2.5kg as initial to the tension of the rope, (Iranian Building codes and standards, Standards No, 2800, 6th Chapter. P: 23).

[33] This collection of books on building standards and regulations has been compiled and prepared on the Building and Housing Research Center and It is reviewed every year. This collection has 22 chapers. The 6th Chapter, is Loads on the building and is used in this part of research.

Thus, the initial tension can be obtained from the following equation:

$$P_0 = \frac{W_m}{A_{rope}} = \frac{2.5*9.81}{\pi \times 0.01^2/4} = 312420\ (N/m^2)$$

6.4.2 Wind Load

By virtue of Iranian Building codes and standards, Standards No, 2800, 6th Chapter, a load resulting from wind must be computed due to maximum wind speed in the area, building height and geometry, protection rate against wind. According to this refrence, basic wind speed (average wind speed in 10 m height above ground in flat area) in the city of Shiraz and its suburbs is about 80 km/h. Thus, the basic wind pressure (pressure imposed by wind basic speed on perpendicular surface to the wind direction) is equal with (Iranian Building codes and standards, Standards No, 2800, 6th Chapter. P: 73):

$$q = 0.005 \times V^2 = 0.005*(80)^2 = 32\ (decN/m^2)$$

Also, pressure or suction due to wind on any building surface, can be obtained from the following equation:

$$P = C_e C_q q$$

Where C_e , is speed variation coefficient, and C_q is form factor (figure coefficient) so that in the proposed model, C_e is 2, and C_q is 1.4.

In addition, the pressure of the wind on the mesh surfaces is equal to the force applied to the whole surfaces that are located along the perpendicular to the wind direction. Therefore, due to the fact that the tent fabric has numerous air holes, the pressure of the wind on this model is (according to the Iranian Building codes and standards, Standards No, 2800, 6th Chapter. P: 73):

$$P_1 = 2 \times 1.4 \times (32 \times 10) \times \frac{\left[(79.96 \times 0.004347) + (78.16 \times 0.002)\right] \times 10^{-6}}{0.004347 \times 0.002} = 51.93(N/m^2)$$

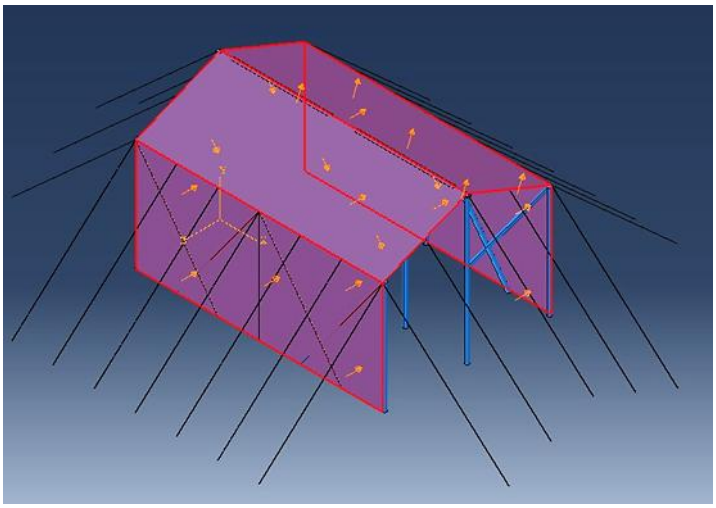


Fig. 158: The wind pressure on the Black Tent, model by author

6.4.3 Snow load

In case of snow fall, due to definition, load is the weight of snow layer. According to the area, current statistics state that its possibility is less than 2% annually (return period is about 50 years). Anyway, basic snow load in various parts of the country must be considered, due to specified classification in Iranian Building codes and standards, Standards No, 2800, 6th Chapter,so that in average snow fall area the minimum load is $P_S = 100(decN/m^2)$.

Due to the $P_r = C_S P_S$ formula according to the formula based on the National Building Regulations the Sixth Issue, the coefficient is equal to the gradient effect, (Iranian Building codes and standards, Standards No, 2800, 6th Chapter. P: 47).

$$C_s = 1 - \frac{22.5 - 15}{60} = 0.875$$

Therefore, the load applied to the structure during snowfall is:

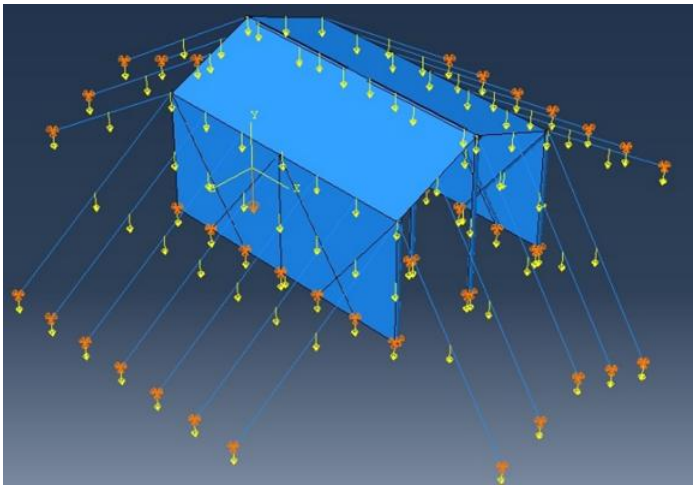


Fig. 159: The snowfall pressure on the Black Tent, model by author

6.4.4 Rainfall load

According to laboratory testing which was conducted, the moisture gained by Black Tents' fabric in a relative humidity (40%) is equal to 7.35%. The fabric recycles dampness, and due to the equation, it is equal water mass percentage compared with the mass of completely dry samples. That is, during rain, increase of the weight due to water absorption by the fabric and a thin layer of water over the fabric is:

$$W_r \approx \frac{(100 - 7.35)}{100} \times \rho_w V_0 g = [0.9265 \times 1000 \times (4720 \times 10^{-6}) \times 9.81] = 42.9(N)$$

$$P_r = \frac{W_r}{A} = \frac{42.9}{59.04} = 0.726(N/m^2)$$

According to the formula obtained from Iranian Building codes and standards, Standards No, 2800, 6th Chapter. P: 62.

Another quality of the Black Tents' fabric is prevention of water penetration through the fabric pores in the rain. Therefore, during the rains, or when water is poured on the fabric, it does not pass through its membrane into the tent. The interior of the Tent remains dry. The main physical phenomenon behind this occurrence is defined as *water*

surface tension that creates a thin layer of water between warps and woofs, which prevents water penetration.

Surface tension is characteristic of the liquids and causes the outer layer of fluid to act as an elastic or tension sheet. This is the same as the feature that leads to the attraction of two liquid levels to each other. It is like two drops of water that attract each other and form larger drops (White, F.M., 2010, p. 114).

Fig. 160: Detachment of water drop and water surface tension resistance, https://blog.faradars.org/surface-tension/

The procedure of assessment of the water permeability was performed according to White, 2014, p. 114-117.

Surface tension is a quantity formulated by the force per unit length.

$$\sigma = \frac{F}{L}\ (N/m)$$

Table 24: Some of the material surface tensions are given below **(**Roshan, 2015 p. 395-436)

fluid	(N/m) surface tension
20°c bronze	0.029
37°c blood	0.058
20ºc glycerin	0.063
0ºc water	0.075
25ºc water	0.073
100ºc water	0.059

If a drop is entangled in space between the fabric warp and woofs, with identical air pressure on both sides of the fabric, there are triple forces applied to (White, F.M., 2010, p. 116):

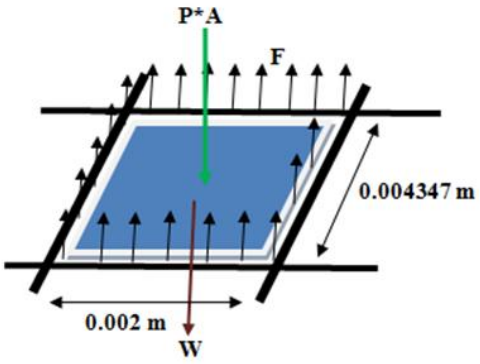


Fig. 161: Forces applied to a drop blocked between the threads of the fabric, source: Roshan, P., 2015, p. 395-436

Downward drop weight

$$W = mg = \rho Vg = 1000 \times (0.002 \times 0.004347 \times 0.00007996) \times 9.81 = 6.82e-6\,N$$

The upward force of surface tension of water which prevents separation of water drops from the water layer on the roof of a tent

$$F = \sigma \times L = 0.073 \times [2 \times (0.002 + 0.004347)] = 926.662e-6\,N$$

External pressure caused by the wind, rain

Due to the surface tension force, the drop entangled between fabric warp and woofs prevents the other drops penetration into the tent, even in the wind. This condition is stable until a touch on the fabric removes the thin layer of water between warp and woof. Even if a fingertip touches a roof of a tent from below with a little force, the surface tension of water of the thin water layer is ruptured and water penetrates the tent from that point.

Minimum pressure of the rain, snow and wind that is required to remove the thin layer is equal to:

$$P = \frac{F - W}{A} = \frac{(926.662e-6) - (6.82e-6)}{0.002 \times 0.004347} = 105.802\ \ pa$$

6.5 Boundary conditions applied to the model of the Black Tent

Boundary conditions included in the model of the tent are divided into two parts:

- **Pin Connection of the ropes into the ground**

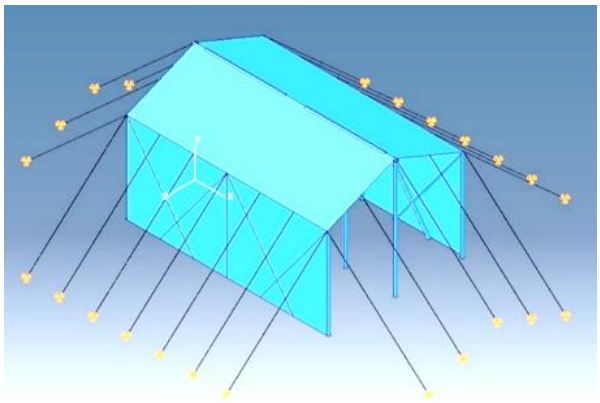


Fig. 162:Boundary conditions applied to the model - the ropes holding structures are conectedto the ground with a pin (connector), model by author

- **Pin Connection of the posts into the ground**

  The Black Tents posts are standing on the ground and only a little part of them is dug into the ground. The reactive factor to their stability is the friction between the ground and the posts. Therefore the pinned connection is the better choice for these conditions than the anchored connection.

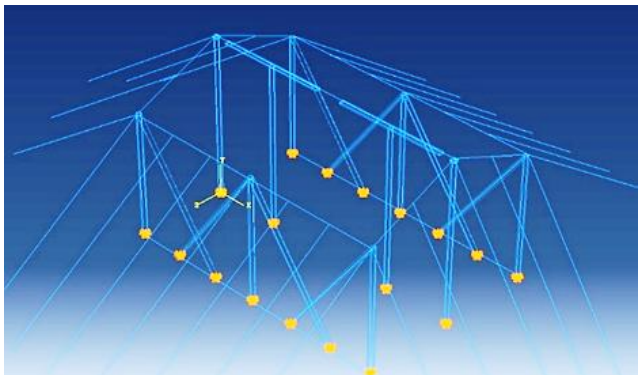


Fig. 163: Boundary conditions applied to the model (tent columns are conectedto the base with pinned, not anchored connection), model by author

6.6 Application of the constraints to the Black Tent model

Constraints used in this model are divided into two sections:

- Connection of the ropes to the tent fabric, which is a constraint-tie

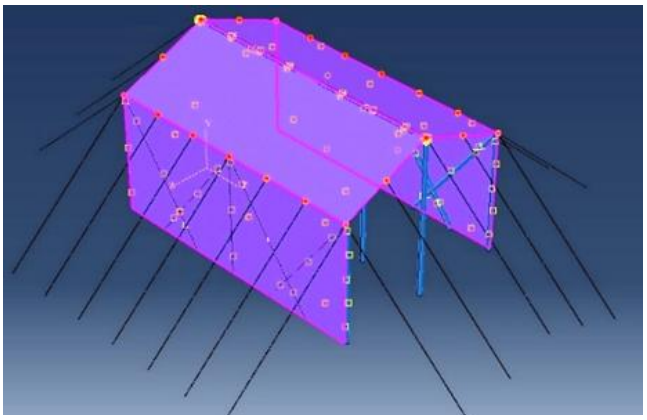


Fig. 164:The constraint-tie model of the Bblack tent, model by author

- Connection as a constraint-tie between the two parts of wood structure and the type of interaction of wood structure and the Black Tent fabric.

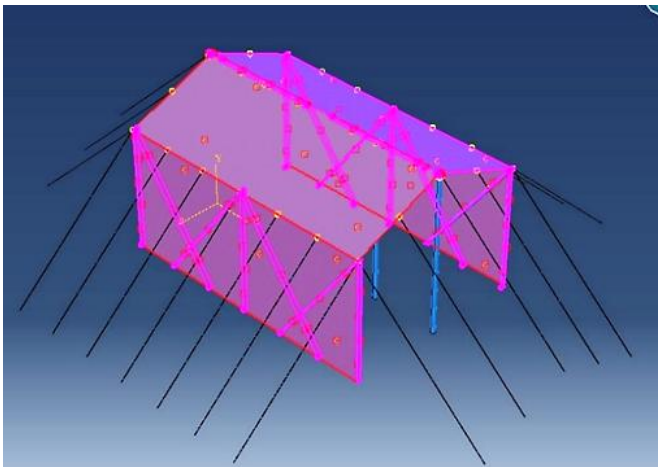


Fig. 165: Connection of the central columns by ridge beam and the interactions between the components of wooden structures with a black tent fabric model, model by author

Based on the above discussion the model the tent designed in ABAQUS software is composed of 47 different elements, each of them was analysed in accordance with location in the structure and constrains it undergoes.

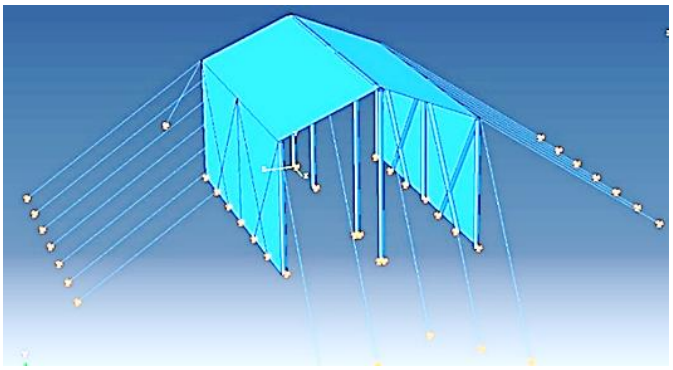
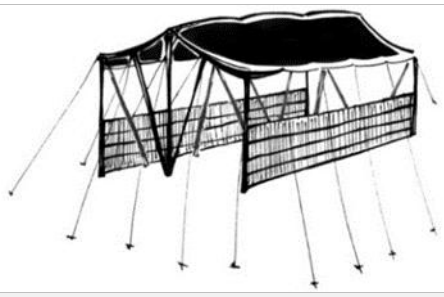
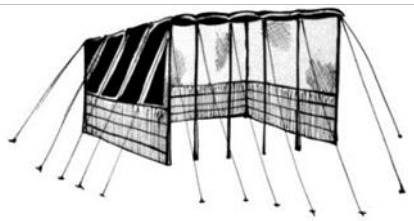
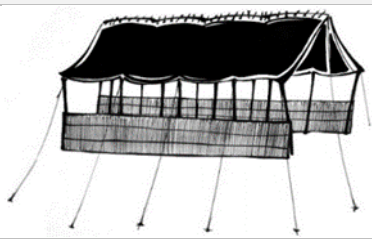
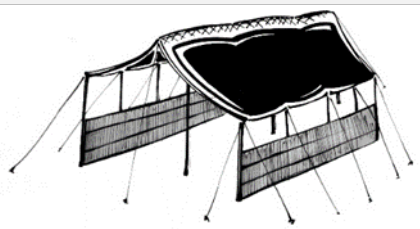
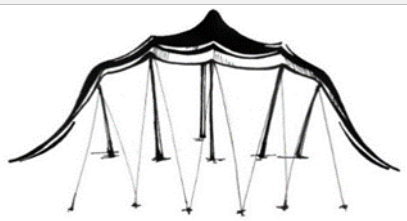


Fig. 166: Model of a sample Black tent in the ABAQUS software, model by author

6.7 Black Tent modeling results

As modelling and analysis of the Black Tents structures is performed for the first time, it is important to double-check the results of the research[34].

Table 25: Structural differences of Black Tents of Iranian nomad tribes, Typology, drawing by author

	
Winter Black Tent of Fars Province	Summer Black Tent of Fars Province
	
Black Tent of Ilam Province	Black Tent of Hamedan Province
	
Black Tent of West Azerbayjan	Black Tent of Golestan Province
	
Black Tent of Sistan Province	Black Tent of Kerman Province

Few years ago the structure of the Black Tent was analysed by the author with the different computing software[35].After some further research the mistake in modelling of the structure of the Tent was found, which made it essential to try to repeat some parts of the modelling again. Previous mistakenly assessed point pertained to connections of

[34]The analysis and modeling checking was done under review of Dr. Amir Tabe Bordbar (PhD, Civil Engineer, Hafez Institute of Higher Education, faculty of Civil Engineer, Shiraz, Iran)

[35] Refrence to chapter 6.1.

the beams and posts and this mistake has entailedwrong tent structure reactions throughout.

The following chapter is explaining the source and the consequences of the mistakes[36]. Then modelling was continued with the reaction of the main fabric of the Black Tent. Finally the modelling is continued by examining another type of fabric, hyper-elastic fabric.The research was applied at first to the Qashqai tribe in Fars Province[37] and after a double-check it was performed on the other tribes' Black Tents[38].

Table 25presents all seven structures of the tents constructed in different parts of Iran by the tribes, that underwent the analysis of their structure.

6.7.1 1st results of modeling the Black Tent

All fabric elements of the roof structure work on the basis of curvature and tension opposed to the wind pressure. Cables (ropes) are important elements stabilizing the structures. Tensions within the fabric of the roof cover play a focal role in keeping the tent in shape and resisting the blows of wind. Tent structure is a tensile shell, so it is stabilized by strain arches. This is why Black Tents have purposely big curvatures of the roof covers. This is achieved by the roof frames consisting of beams supported by main and lateral posts. For modelling the reactions of the structures of the tents to blowing wind, professional software ABAQUS (Finite Elements Analysis) was used. These results were modelled in two situations: firstly, when the Black Tent was supported along the walls by the lateral inclined posts (braces), and then without braces. Both structures were checked for wind loading force.

The mistake of this modelling was in its structure. Place of the central columns with ridge beam and its junction. The columns were joined together but in reality they were spaced from each other. Generally this model shows the reaction of the Black Tent to the wind load in a situation when the brace posts are joined together.

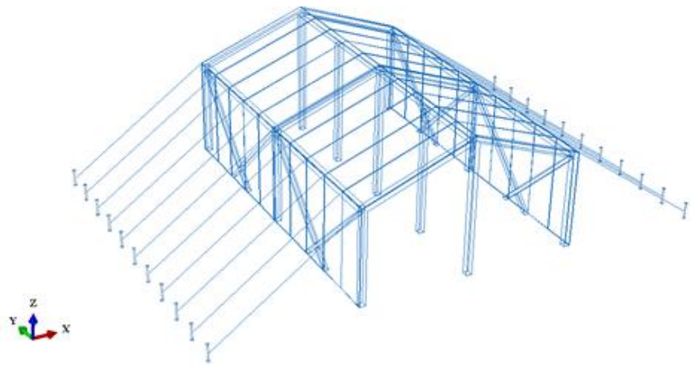
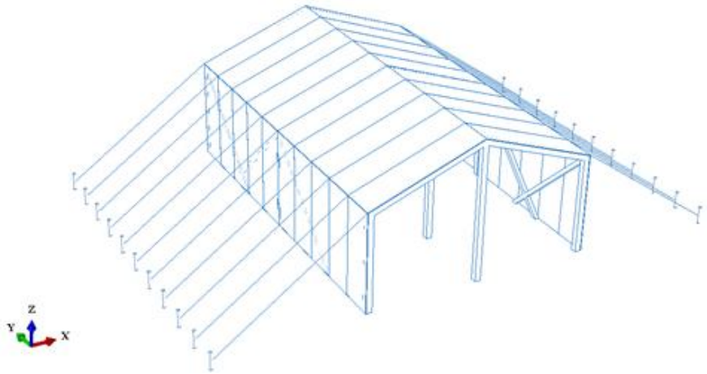
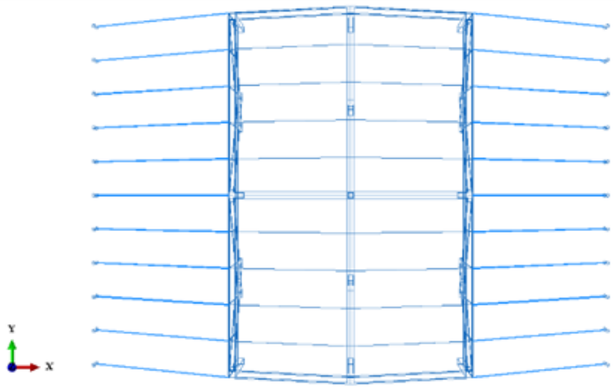
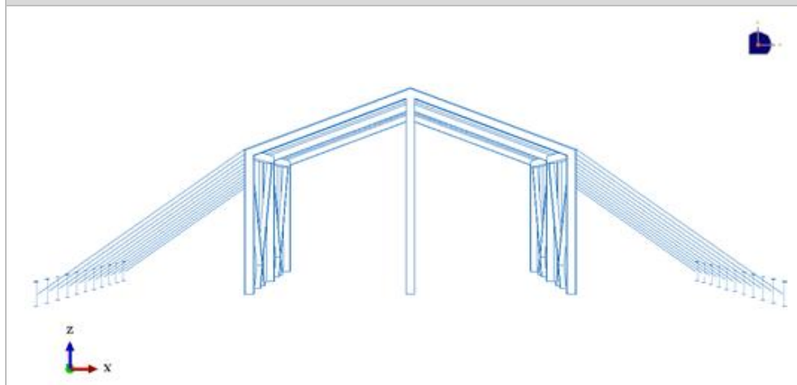
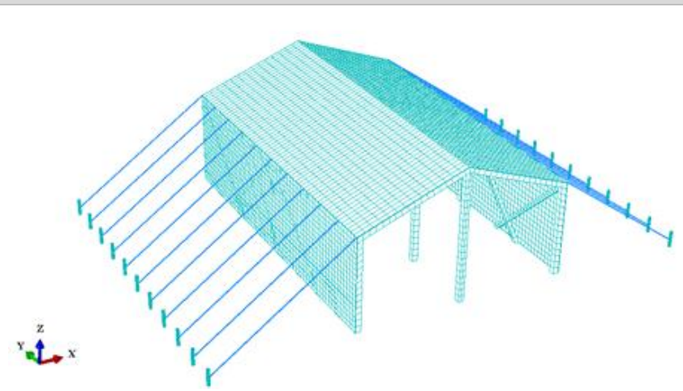
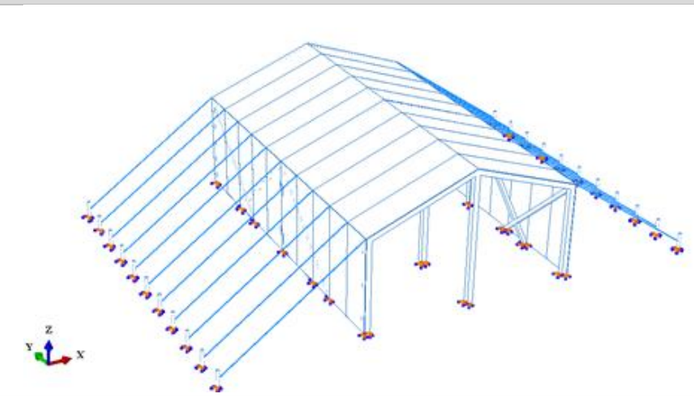
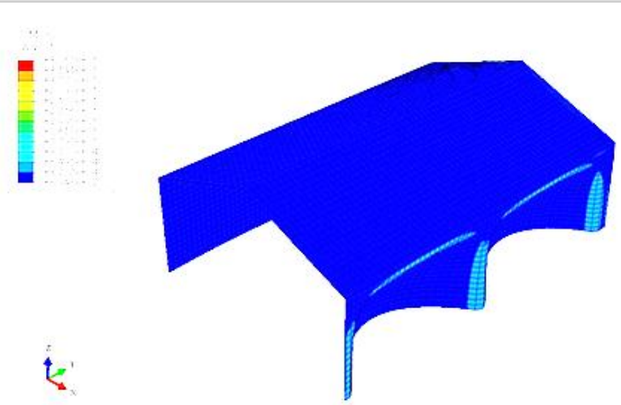
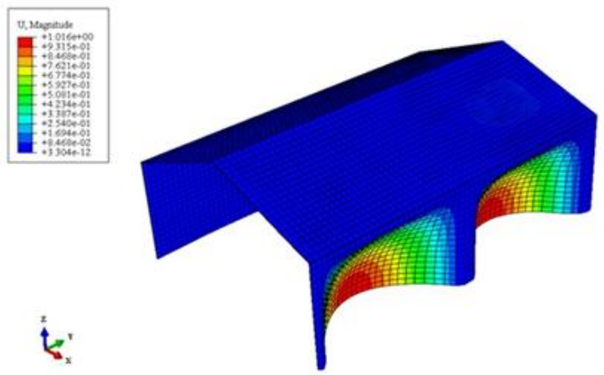
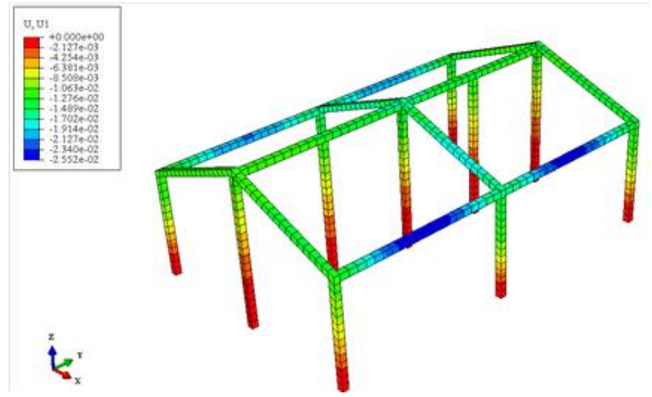
The Black Tent structure of the tribe No.1 from Qashqai in Fars Province is ready for further research, based on the record included in the followingTable 26and the 1st modelling result.The structure behaviour under the wind load,was observed with assumption of on the goats' hair fabric cover. (Chapter3.2.1, Table 7).It shows the reaction of the Tent structure under wind load with the lateral inclined posts (braces) and without them.

[36]The analysis and modeling was done under review of ENG. Mahmoud Chegini (Ms, Civil Engineer Faculty, Shiraz, Iran)

[37] The analysis and modeling was done under review of Dr. Mohammad Kojouri (PDENG Mechanics, University of Twente, Netherland)

[38] The analysis and modeling was done under review of ENG. Sajad Aslan nezhad (ENG, Mechanics, Islamic Azad University of Jahrom, Iran)

Table 26:1st modeling result, modeling of the Black Tent, by author

26aA: Wireframe	26B: Hidden	26 C: View X-Y, Wireframe
		
26 E: View X-Z	**26 F: Meshing of the tent elements**	**26 G: Boundary Conditions**
		
26 I: Von Mises stress (Without Bracing)	**26 J: Absolute value of displacement (without bracing)**	**26 K: Columns**
		

6.7.2 2nd modeling result, modeling of the Black Tent with the hyper-elastic fabric cover

According to Dynamic Explicit model and 1 second time period assumption obtained the non-liner system response as follows:

- Displacement rate of all points of the structure
- Imposed stress value due to external imposing loads onto the structure

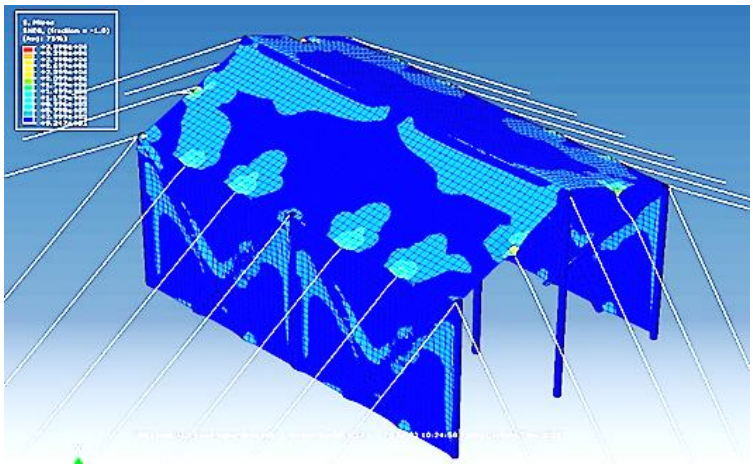


Fig. 167: The initial stress applied to the structure by holder ropes (hyper-elastic model), model by author

The results of the analysis are shown in the guide table by the colour spectrum.The reaction of tension force is decreased from red colour to blue colour.
As observed from above the figure, due to initial tension in ropes, connection points between the ropes and the tent cover show significant displacements.
The connection point is a just a unique point, while in reality, it is a small part of the tent fabric that is connected to holder rope through a connecting ring and wooden hook that is ignored in the model of a tent.

- **Wind load on the Black Tent**

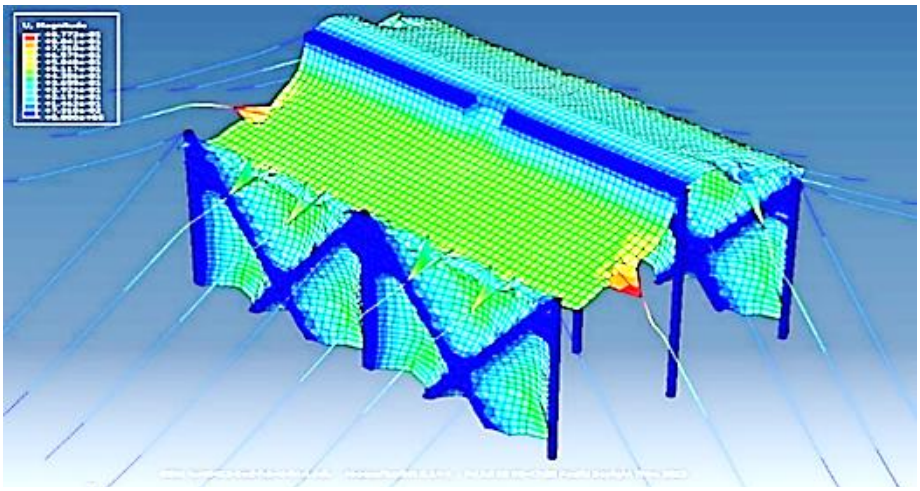


Fig. 168: The Black tent elements displacement rate while applying wind pressure to the Black Tent (hyper-elastic model), model by author

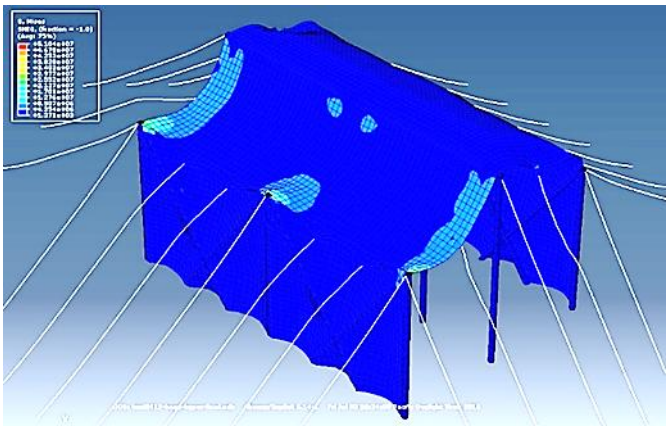


Fig. 169: BlackTent elements.Von Mises stress due to wind pressure applied to the Black Tent (hyper-elastic model), model by author

According to the results of this section, due to external wind pressure $51.93\,pa$, the maximum displacement rate of the Black Tent is 50 cm and the von Mises stress is $8\,Mpa$.

- **Rainfall load of the Black Tent**

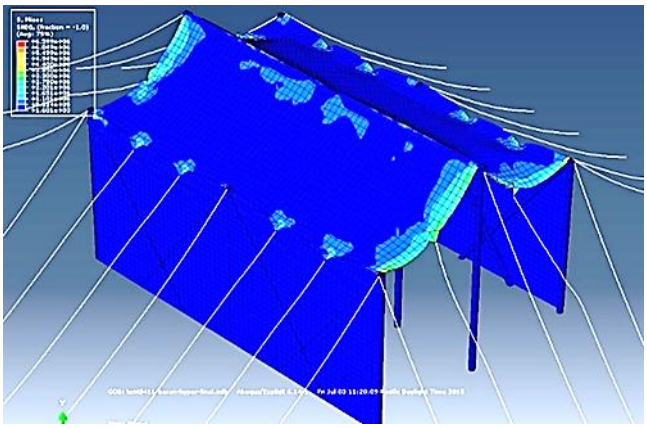


Fig. 170: Black Tent elopements. Von Mises stress caused by rain pressure to Black Tent (hyper-elastic model), model by author

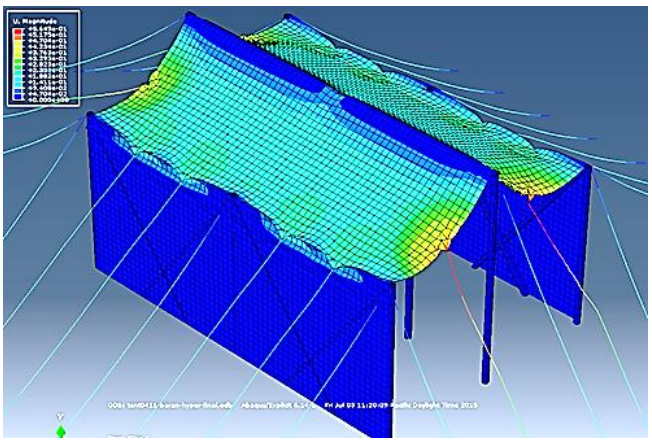


Fig. 171: The Black Tent elements displacement rate caused by rain pressure (hyper-elastic model), model by author

According to the results of this section, due to the rainfall, the displacement rate of the Black tent is 28 cm and the von Mises stress is $1Mpa$.

- **Snowfall load of the Black Tent**

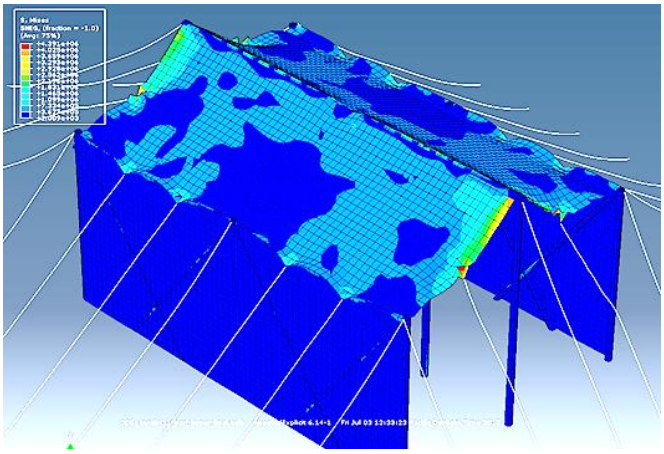


Fig. 172: Black Tent elopements. Von Mises stress caused by snowfall pressure (hyper-elastic model), model by author

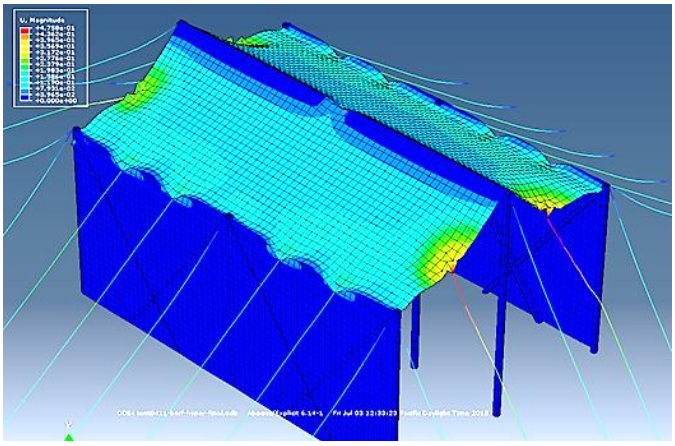


Fig. 173: The Black Tent elements displacement rate caused by snowfall pressure (hyper-elastic model), model by author

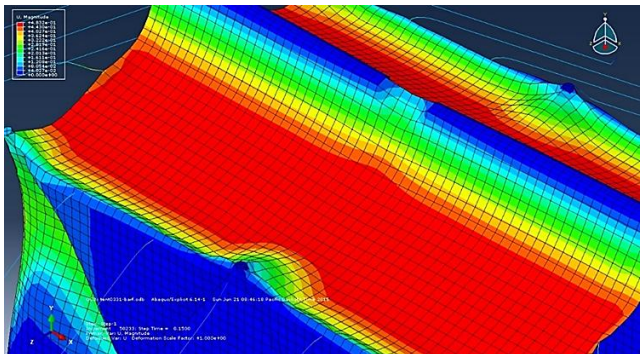


Fig. 174: The Black Tent elements displacement rate caused by snowfall pressure. In the case of the removal of two units of rope holder (hyper-elastic model), moder by author

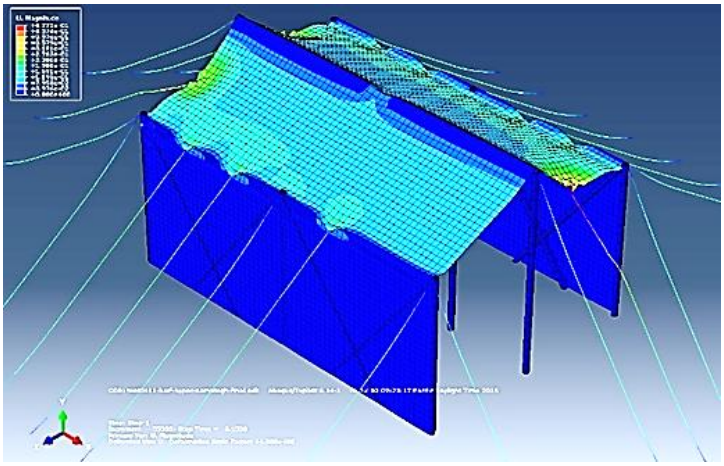


Fig. 175: The displacement rate of Black tent roof elements by snowfall force equivalent $52.5(N/m^2)$ (hyper-elastic model), model by author

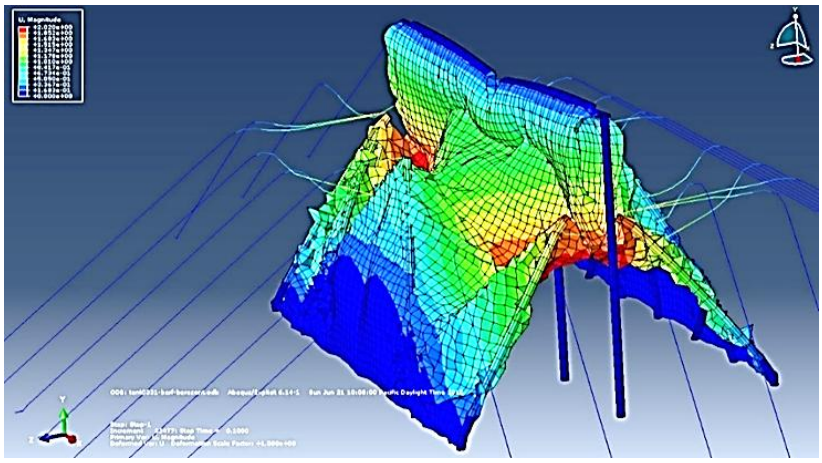


Fig. 176: Tents element's Von Mises stress by force of snow equivalent $875(N/m^2)$, this test was performed with a fabric without the air pores, model by author

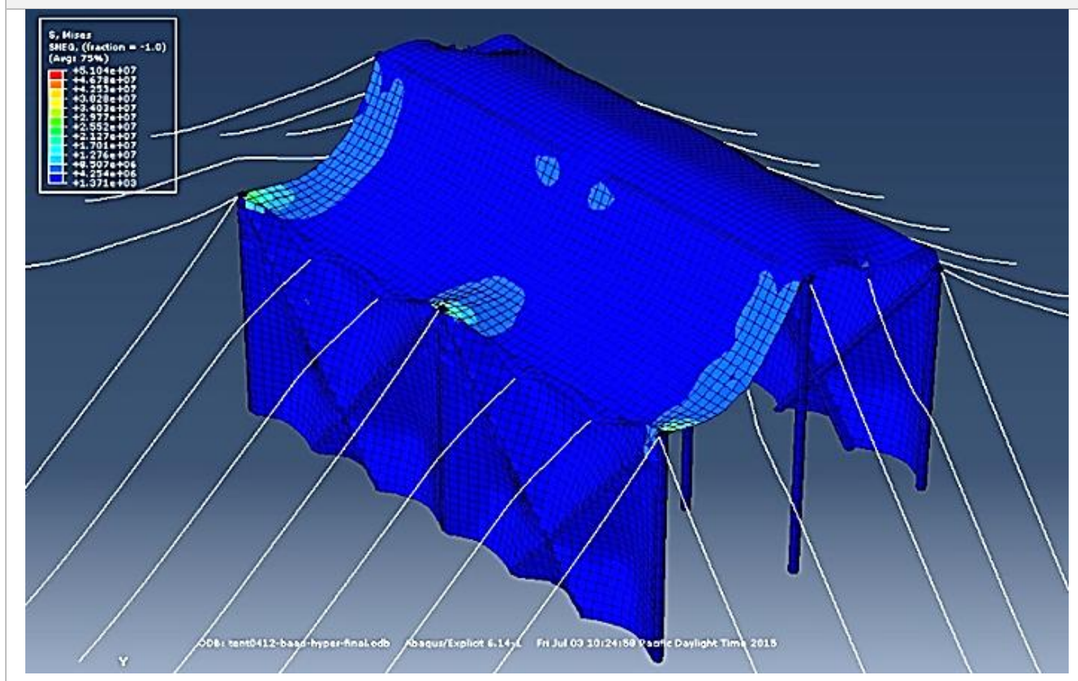
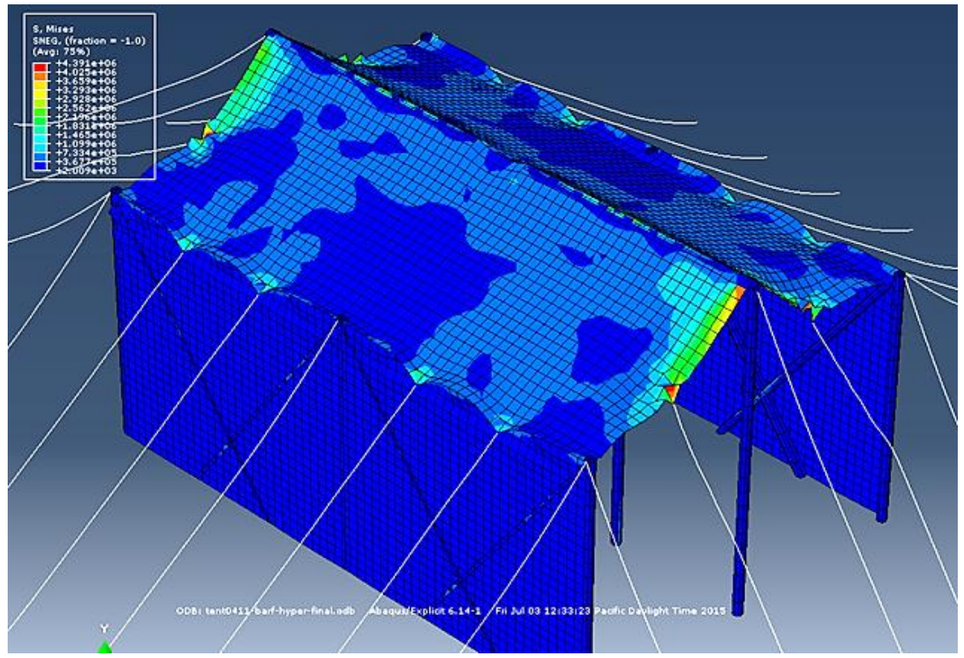
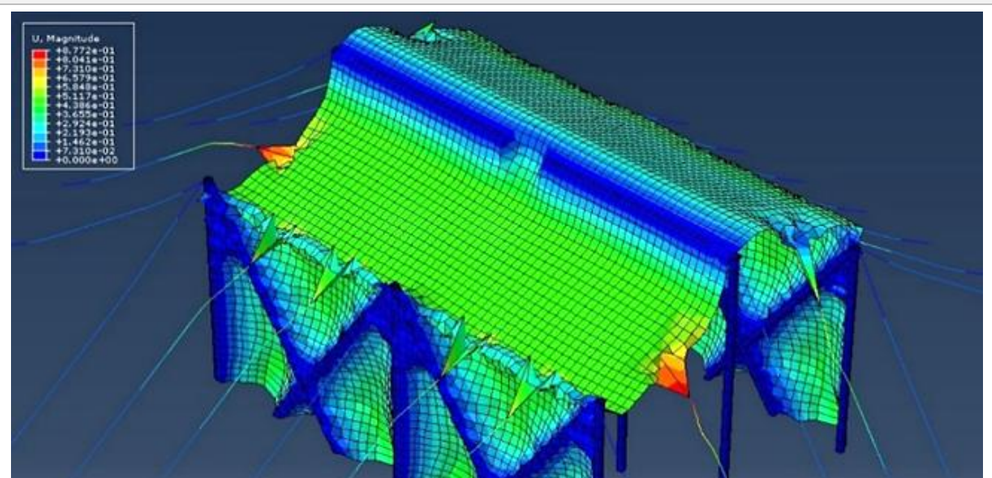
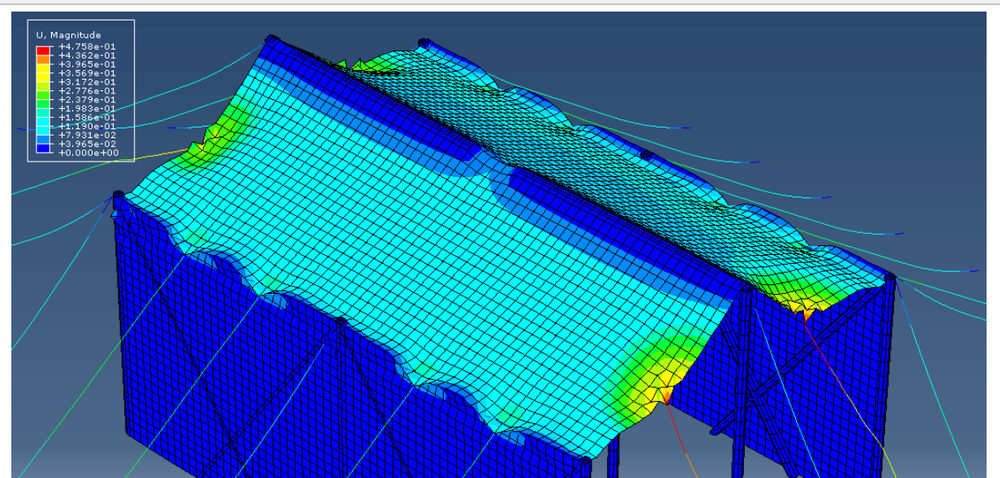
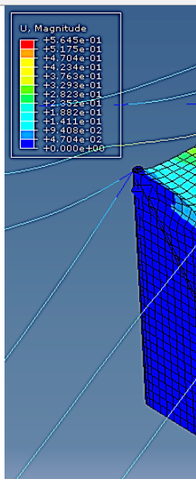
As it was observed, if a nonporous fabric cover is used,durability of the wooden structure against imposing forces was overpassed and the structurefell. In case of increased snowfall, the Tent became imbalanced and would also collapse.

This factor is one of the reasonswhy the goat hair fabrics were and still are used rather than canvas or any fabric.

In general, it should be noted that the amount of snow falling in time of the nomads' stay in their winter settlements is very limited. This part of modelling was done just to show the effect of the natural forces on the Tent structure.

In theTable 27the record on the Black Tent structure of the tribe No.1 from Qashqai in Fars Province suffices also for further experiments. In the 2nd modelling attempt, the structure was observed under wind, rain and snow load (Chapter3.2.1, **Table 7**) but with the Hyper-Elastic fabric cover. These resultsemployVon Mises stress and displacement rate while applying wind, rain and snow pressure of the Tent structure.

Table 27:2nd modeling result, Modeling of the Black Tent with Hyper-Elastic fabric, arrangement by author

27 A. Black Tent structure: Von Mises stress due to wind pressure - applied to the tent (Hyper-Elastic Model)	27 C. Black Tent structure: Von Mises stress caused by snowfall pressure (Hyper-Elastic Model)	27 E. Black Tent (Hyper-Elastic M
		
27 B. Black Tent elements displacement rate while applying wind pressure (Hyper-Elastic Model)	27 D. Black Tent elements displacement rate caused by snowfall pressure (Hyper-Elastic Model)	27 F. Black Tent Model)
		

6.7.3 3rd modeling result, modeling of the Black Tent with its fabric made of goat hair

To built this model, fabric with dimensions of 0.5 x 0.5 with 3D membrane model was built in the ABAQUS software. The model was pressed by $40\,N/m^2$ weight. The boundary conditions used in the model is a pin connector on four sides of the fabric and it is shown in the Fig. 177:

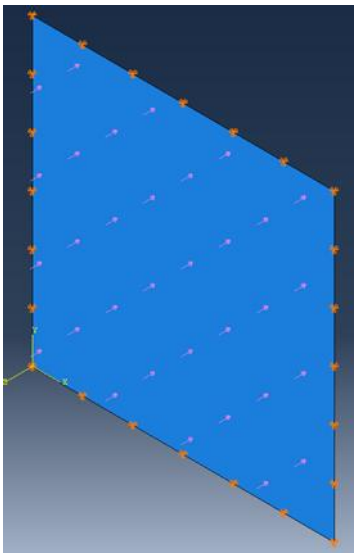


Fig. 177: Model made of Black tent fabric, model by author

It should be noted the ABAQUS software solutions might solve problems like the above mentioned example. Intended specific material (tecture of goat hair fabric) was modelled in a state of *Dynamic Explicit*.
Therefore, in this modeing this mode was used to solve the problem. Responses obtained from this experiment are given below:

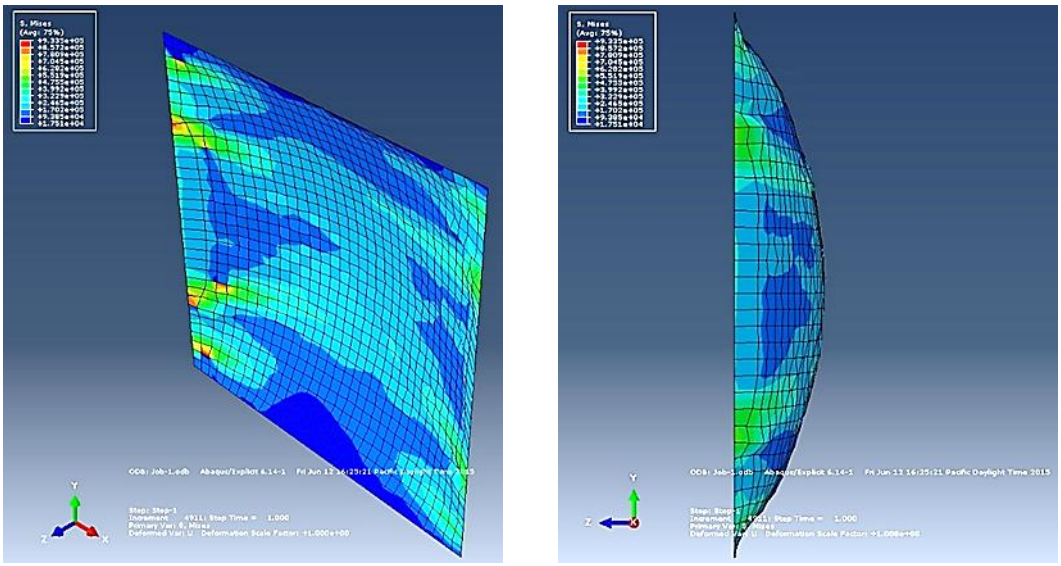


Fig. 178: Von Mises stress of the tent element, model by author

Due to load imposition, the fabric is bent. In this model, due to the fact that the fabric is considered as non-isotropic, non-linear body, the strain, stress and displacement ratios were different along warp and woof directions. This case was identified in stress distribution method in the current model.

Also, as the Fig. 178, the maximum von Mises stress in this case is 0.933 Mpa and the maximum of displacement in the Z direction as shown in Fig. 179 is 8.8 cm.

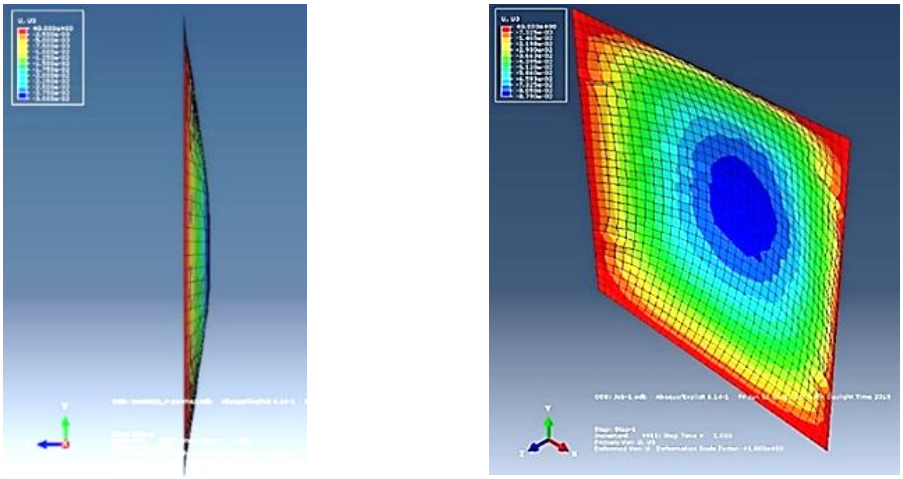


Fig. 179: The displacement elements along the Z direction, model by author

As mentioned before, in the case of the aerial porous fabric entered as the Black Tent fabric, maximum von Mises stress is 0.17 Mpa and maximum displacement in Z direction is 3 cm, as is shown on the following figures:

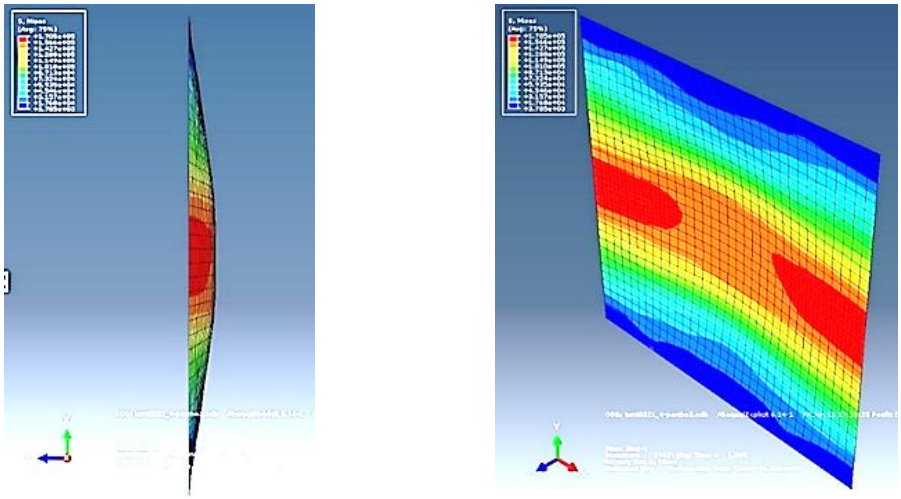


Fig. 180: Von Mises stress of fabric, model by author

Accordingly, the main difference between Black Tent fabric and the other fabrics are the aerial pores between the fibers. This helps to lower the influence of pressure on fabric by the wind. Thus, the force imposed on the timber structure is decreased too.

Therefore, in this case the Black Tent was modeled on the basis of its original fabric assumptions. According to the Dynamic Explicit model and 1 second period assumption, the non-linear system response, all points of the structure displacement rate, the imposed stress value due to external loads on the structure, come as follows:

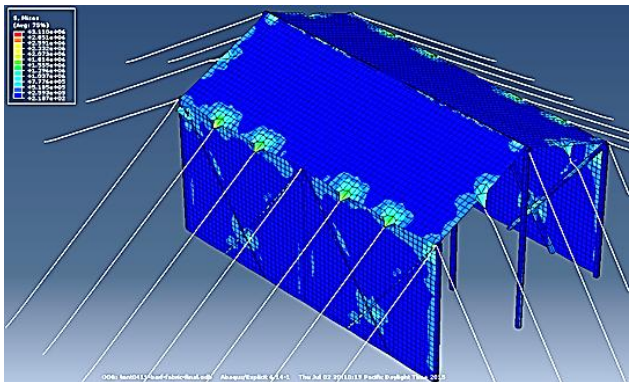


Fig. 181: The initial stress applied to the structure by holding ropes (fabric model), model by author

As observed from the Fig. 181, due to initial tension in ropes, connection point between ropes and the tent shows significant displacement. But generally about the ropes tension, this model with goats' hair fabric is in better situation as in the Hyper-Elastic model (Fig. 167). In the first step, this point shows that the main fabric of the Black Tent works better than the other fabrics in this structure.

- **Wind load of the Black tent**

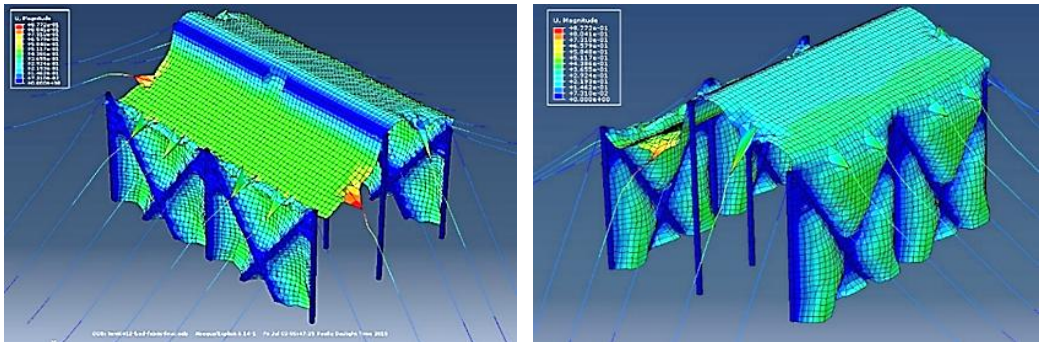


Fig. 182: Black Tent elements displacement rate caused by the wind load on it (fabric model), model by author

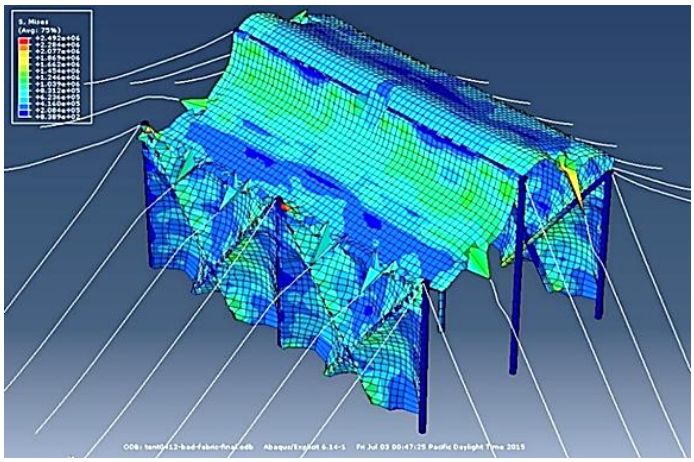


Fig. 183: Black Tent elements Von Mises stress due to wind pressure applied (fabric model), model by author

The Hyper-Elastic model has assumed that fabric warp type is similar like woof, then the fabric in observation has greater strength. Thus, the displacement is less than the real fabric in the Black tent model. This differences is insignificant in reality of the tent fabric.

- **Rainfall load of the Black Tent**

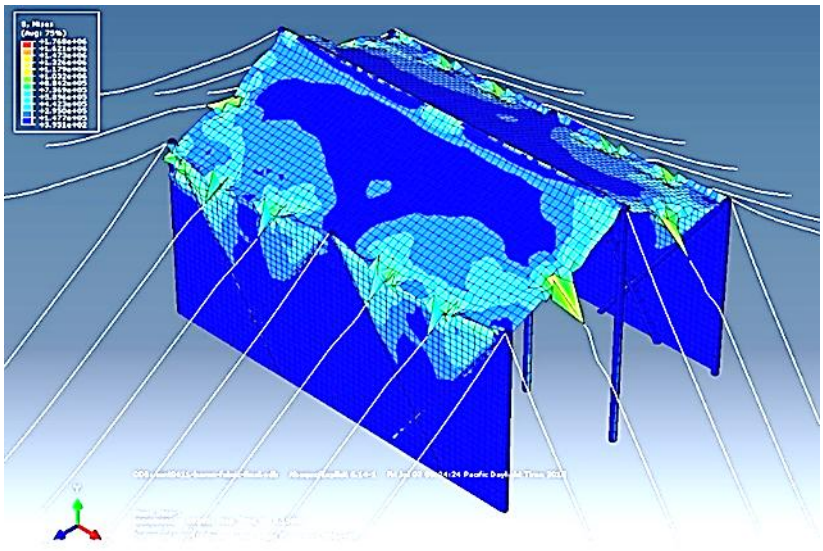


Fig. 184: Black tent elements von Mises stress caused by rain pressure to Black tent (fabric model), model by author

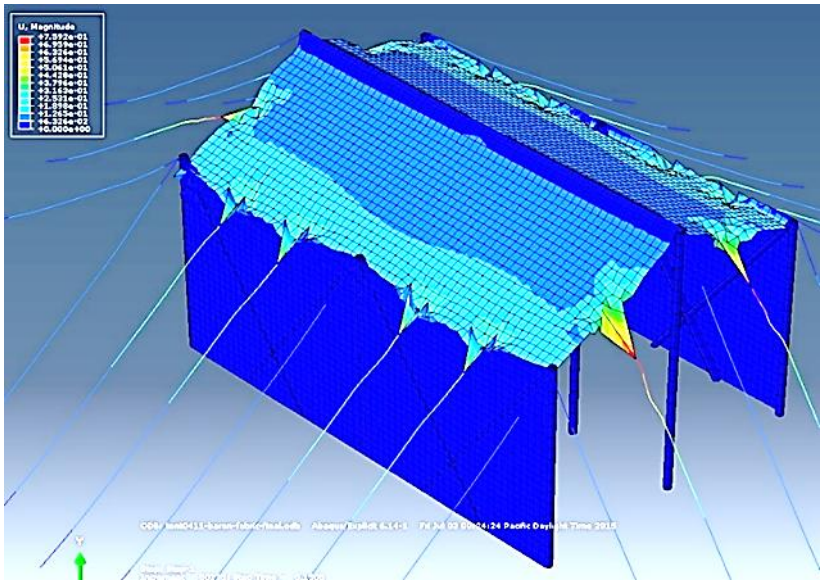


Fig. 185: The Black tent elements displacement rate caused by rain pressure (fabric model) , model by author

Von Mises stress in the model structure during rainfall is 0.3 MPa and the average Black tent displacement is 15 cm.

- **Snow fall load of the Black Tent**

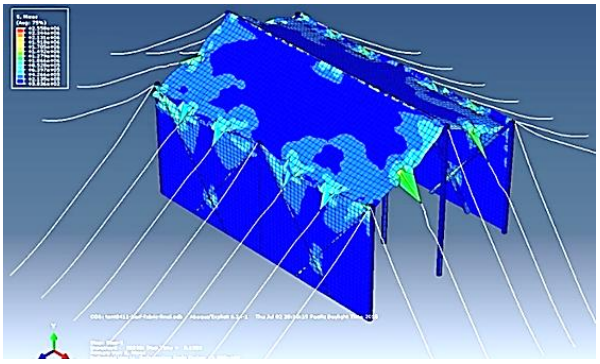


Fig. 186: Black tent elopements - von Mises stress caused by snow pressure (fabric model), model by author

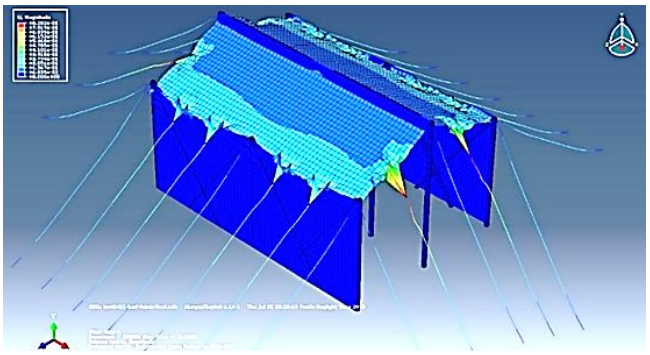


Fig. 187: The Black tent elements displacement rate caused by snow pressure (fabric model), model by author

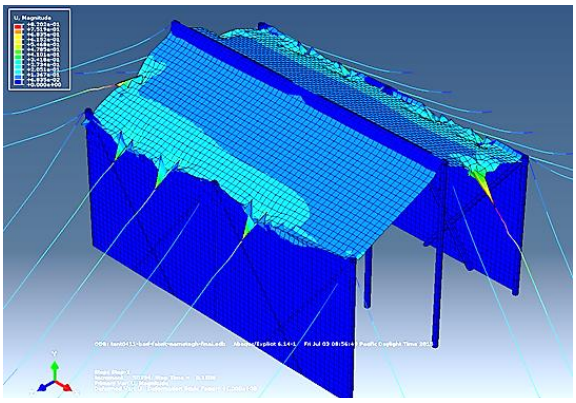
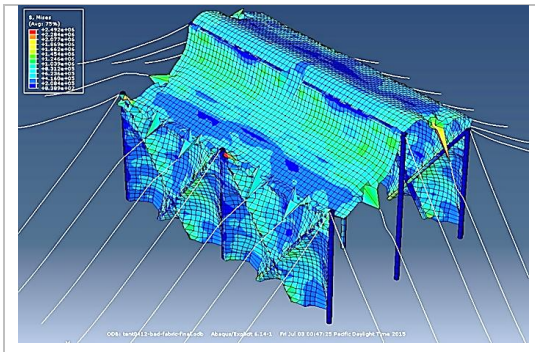
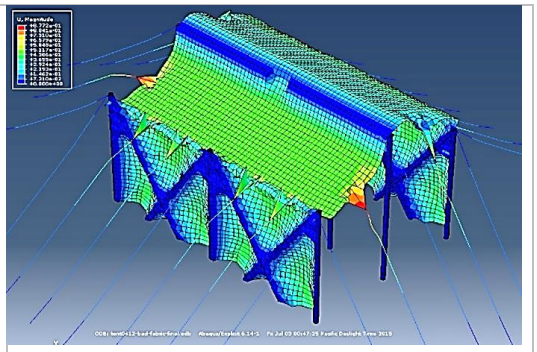
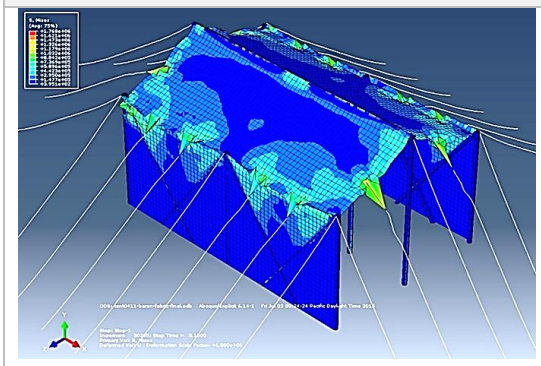
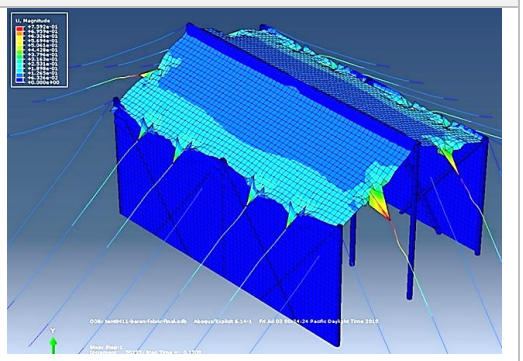
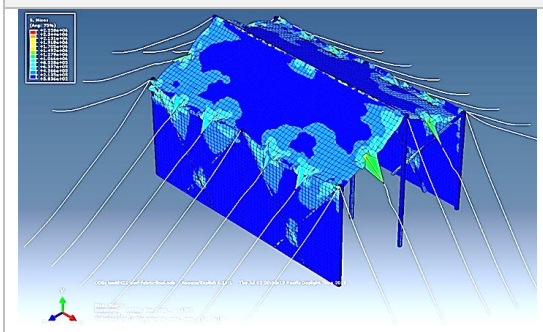
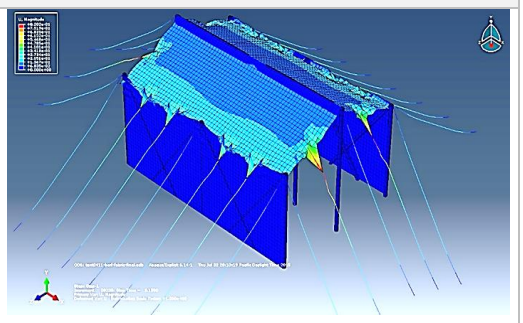


Fig. 188: Black tents elements displacement rate caused by the snowfall (fabric model) in the case of removing two holding ropes, model by author

As observed from the above figures, a part of pressure on the structure transferred onto the holding ropes. The way to find real functions of the ropes in the current model, is to remove some ropes and by studying the results the black tent displacement rate might be observed. The result shows that after removal of the holding rope the neighboring nodes of connection were elongated by further 7 cm.

InTable 28, the Black tent structure of the tribe No.1 from Qashqai in Fars province ready for further experiments and the 3rd modeling result, with the structure under the wind, rain, snow load (Chapter3.2.1, **Table 7**) observed on the main fabric of the black tent (goat hair) cover. This result shows the Von Mises stress and displacement rate while applying wind, rain and snow pressure of the tent structure.

Table 28: 3rd modeling result, modeling the Black Tent with its fabric of goats' hair, by author

	
Black Tent elements Von Mises stress due to wind pressure applied (fabric model)	Black Tent elements' displacement rate caused by the wind load (fabric model)
	
Black Tent elopements Von Mises stress caused by rain pressure (fabric model)	Black Tent elements' displacement rate caused by rain pressure (fabric model)
	
Black Tent elopements Von Mises stress caused by snow pressure (fabric model)	Black Tent elements' displacement rate caused by snow pressure(fabric model)

6.7.4 Typology and comparison of the Black Tents

Structural diversifications of the Black Tents of Iranian nomad tribes are presented as digitalized models undergoing wind, rain and snow loads.They are observed as covered with goats' hair fabric – the cover they get in reality. The results show the average Von Mises stressfor the surfaces of the Black Tents and displacement rates while wind and rain pressure was applied on the Tent structure model. Since there are no significant snowfalls in the areas of nomadic settlements, the snow load has not been calculated, although the models for it were prepared. The results of the analysis for all seven tribes are presented in the Table 29

Table 29:Typology and comparison of the Black Tents structure

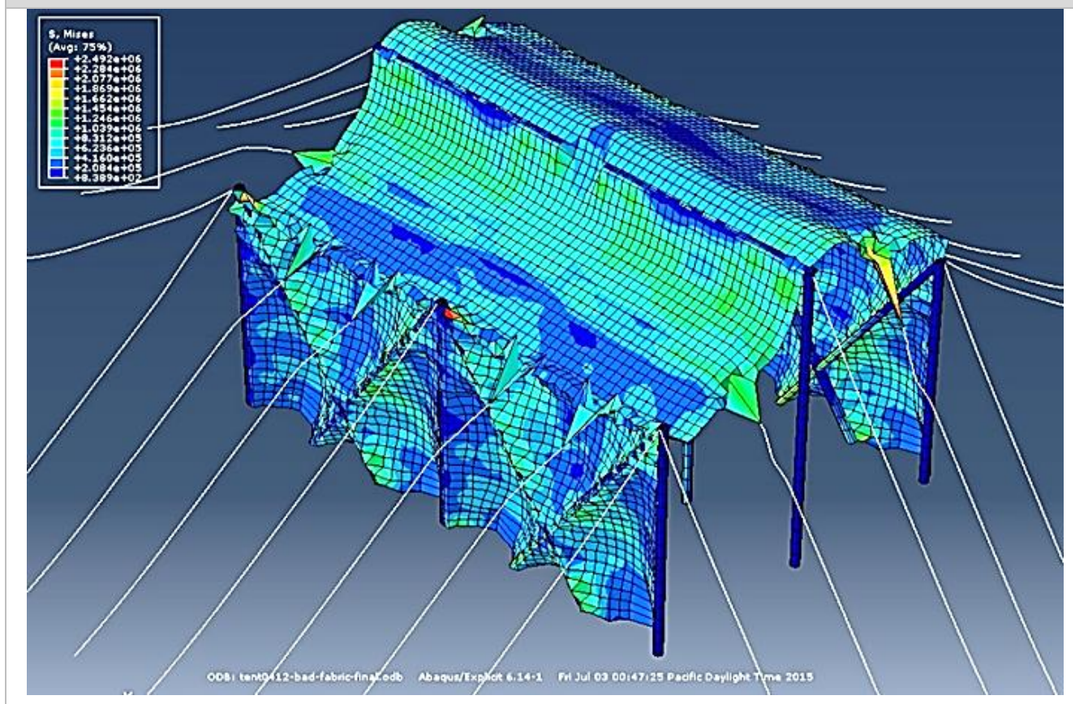
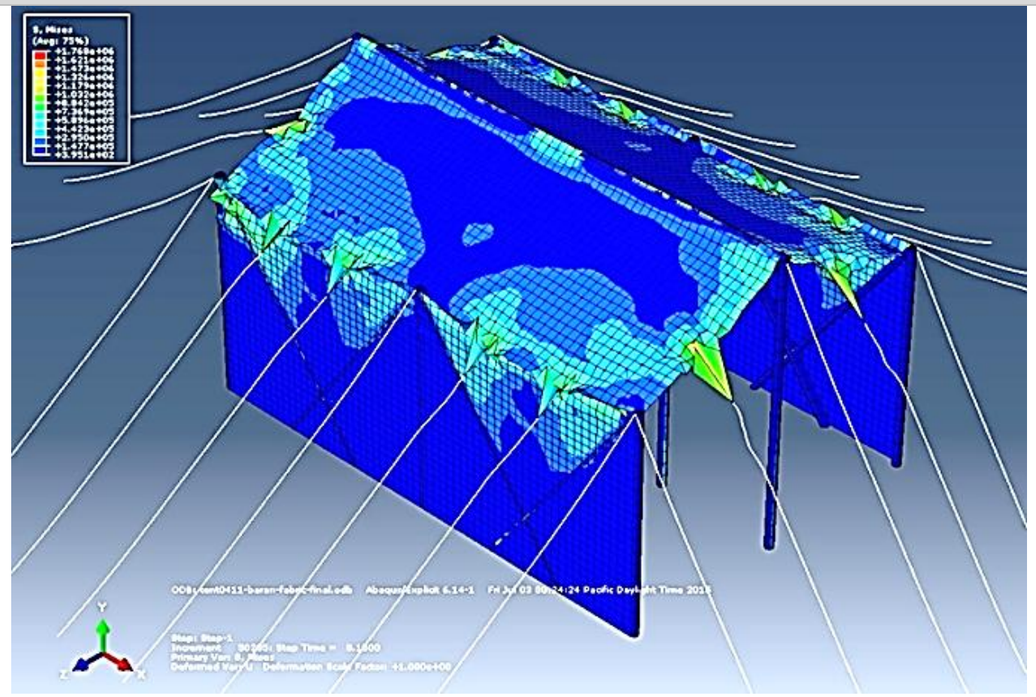
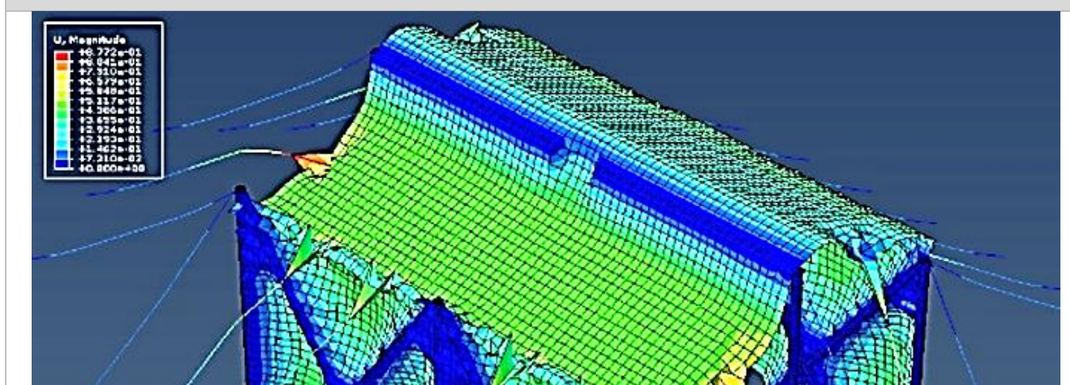
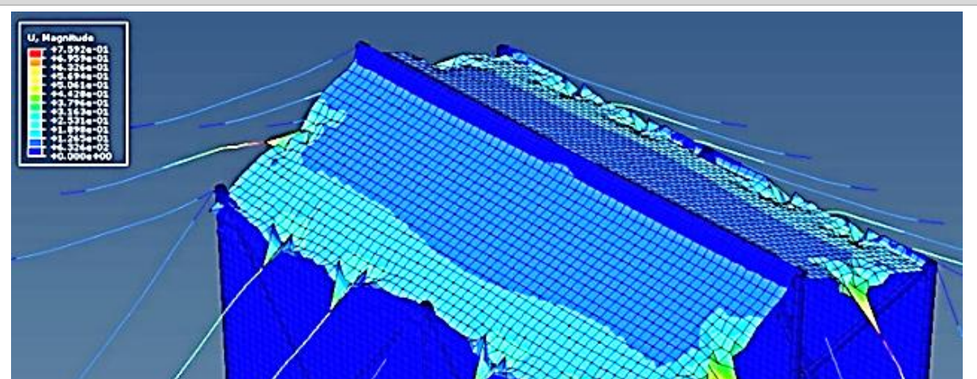
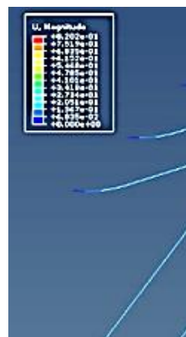
Table 29 A: Modeling of the Tribe No. 1. Fars Province Black Tent, arrangement by author		
Black Tent elements,Von Mises stress is 0.8312 MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements Von Mises stress is 0.3 MPa due to rain pressure applied to the tent (fabric model)	Black Tent e
		
Black Tent elements displacement is 511 mm due to wind pressure applied to the black tent (fabric model)	Black Tent elements displacement rate is 150 mm due to rain pressure applied to the black tent (fabric model)	Black Tent e
		

Table 29 B: Modeling of the Tribe No. 2. Ilam Province Black Tent, arrangement by author

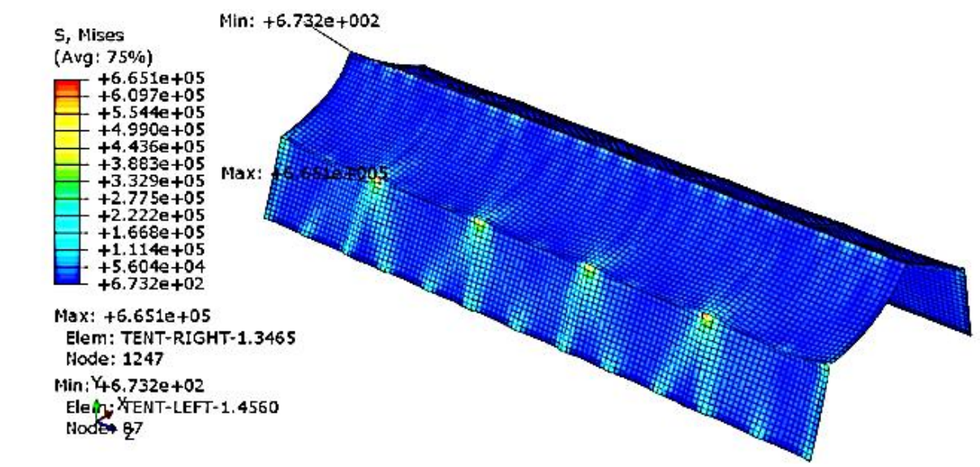
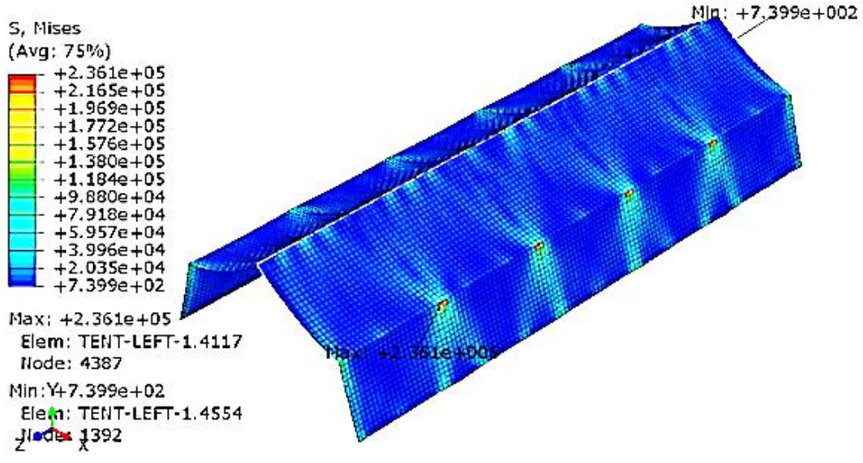
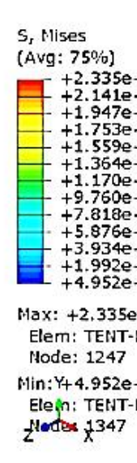
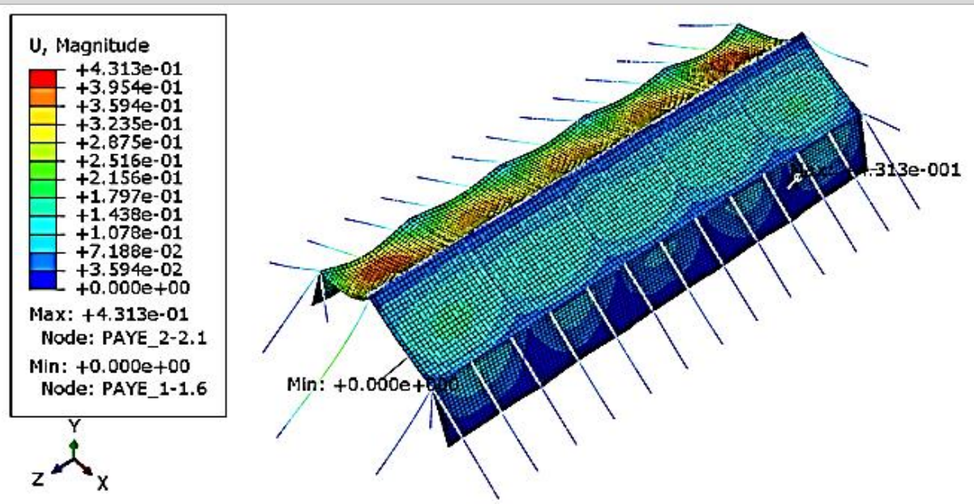
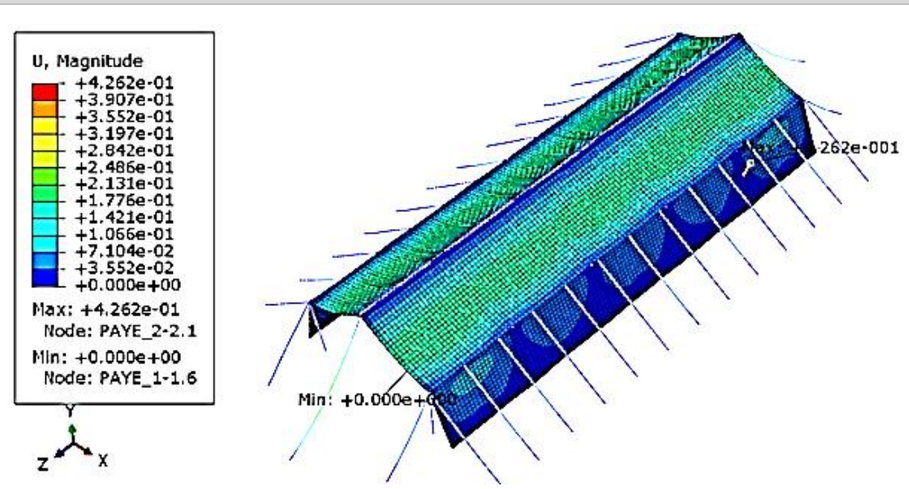
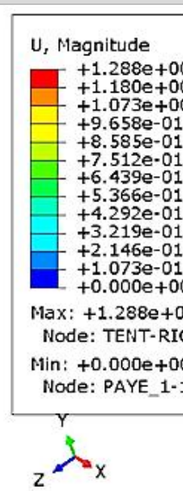
Black Tent elements,Von Mises stress is 5.604 x 10^{-2} MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements,Von Mises stress is 2.035 x 10^{-5} MPa due to rain pressure applied to the tent (fabric model)	Black Tent ele
		
Black Tent elements displacement rate is 143.8mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 248.6 mm due to rain pressure applied to the tent (fabric model)	Black Tent e
		

Table 29 C: Modeling of the Tribe No. 3. Hamedan Province Black Tents, arrangement by author

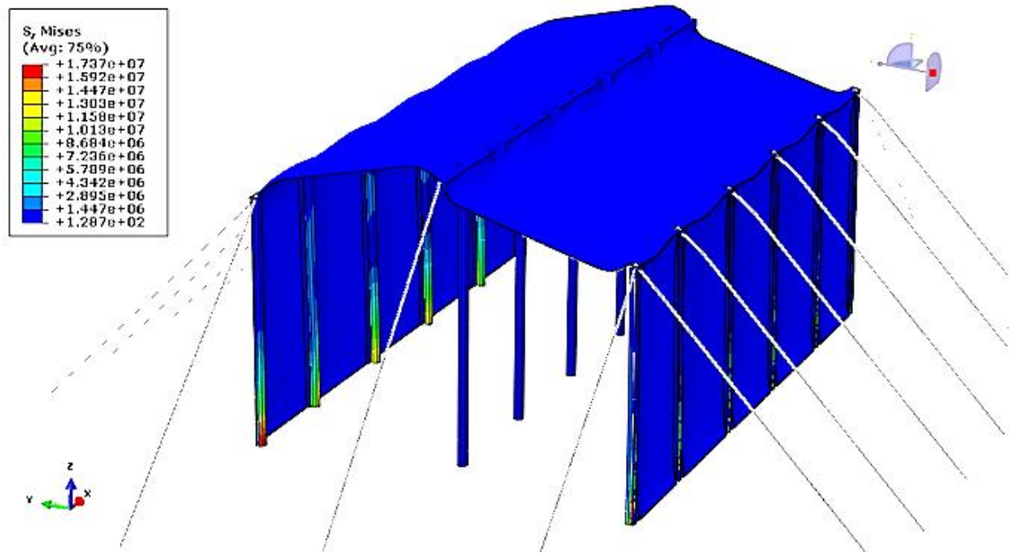
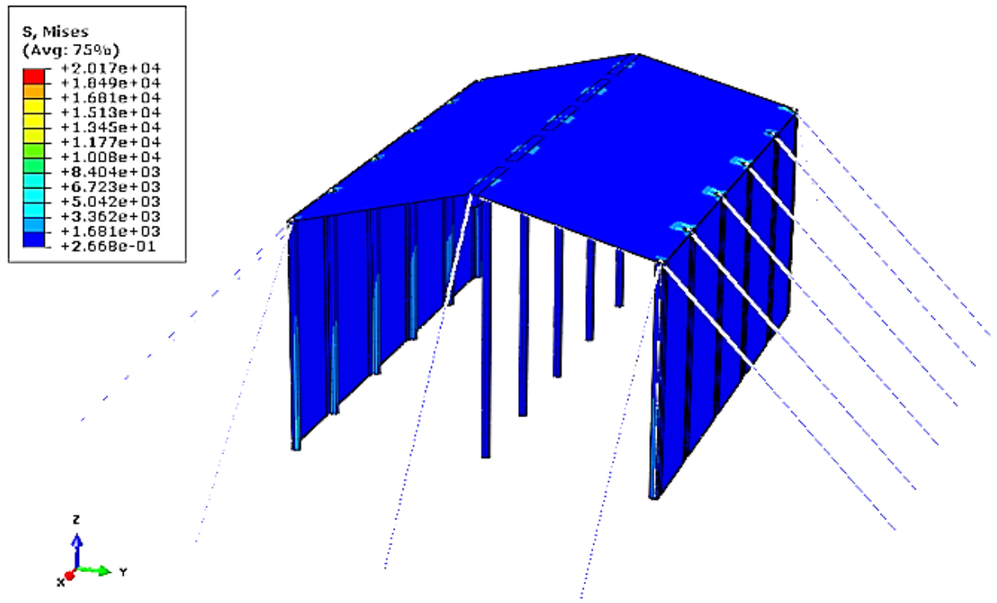
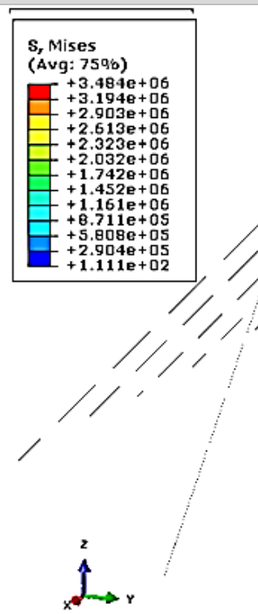
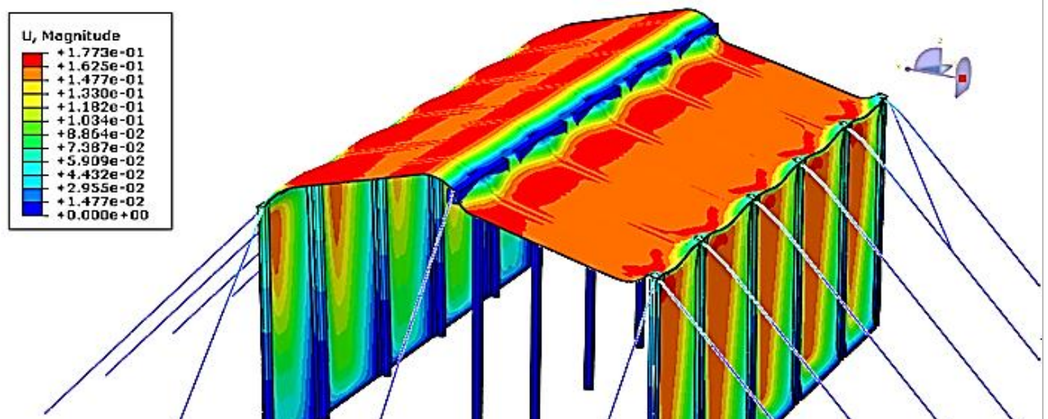
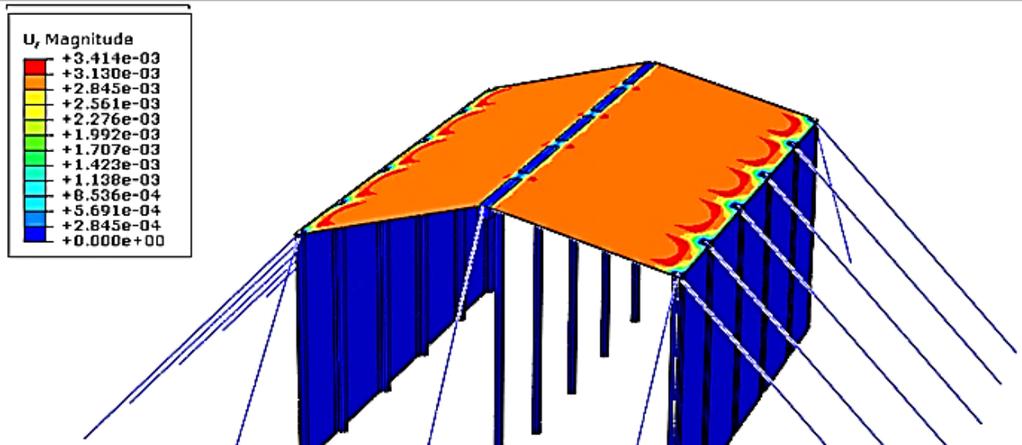
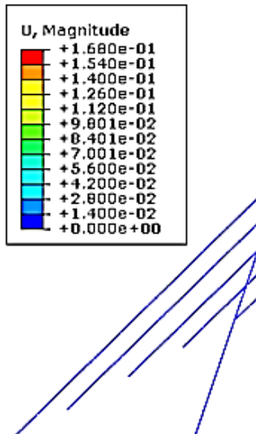
Black Tent elements,Von Mises stress is 2.89MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements Von Mises stress is 3.36 x 10^{-3} MPa due to rain pressure applied to the tent (fabric model)	Black Tent elemen
		
Black Tent elements displacement rate is 162.5mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 3.13 mm due to rain pressure applied to the tent (fabric model)	Black Tent eleme
		

Table 29 D: Modeling of the Tribe No. 4. West Azarbaijan Province Black Tents, arrangement by author

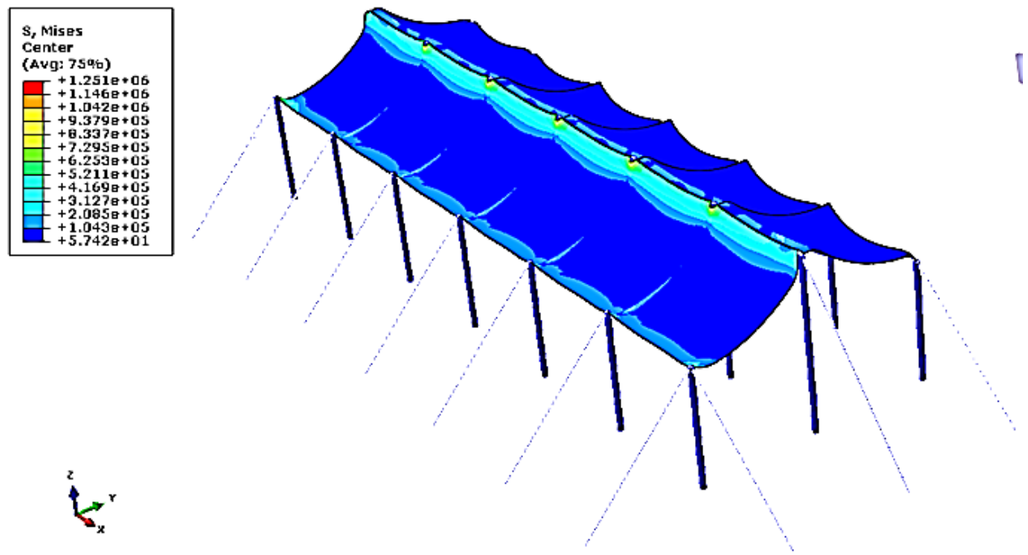
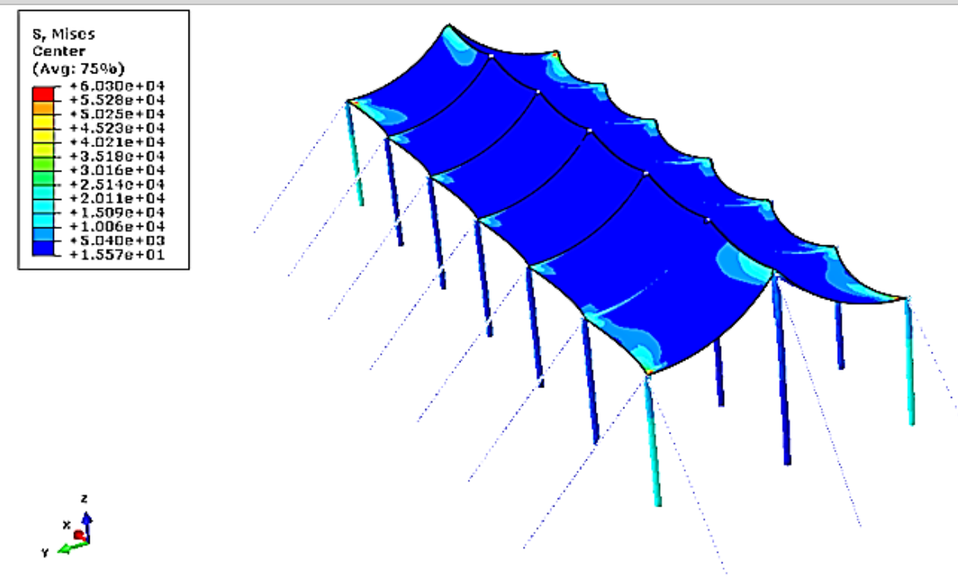
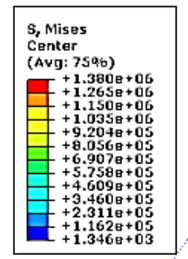
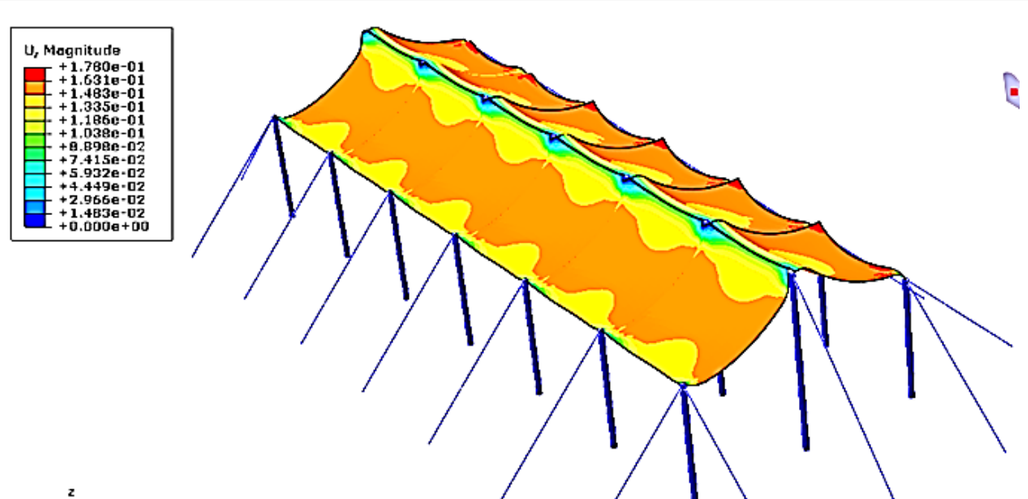
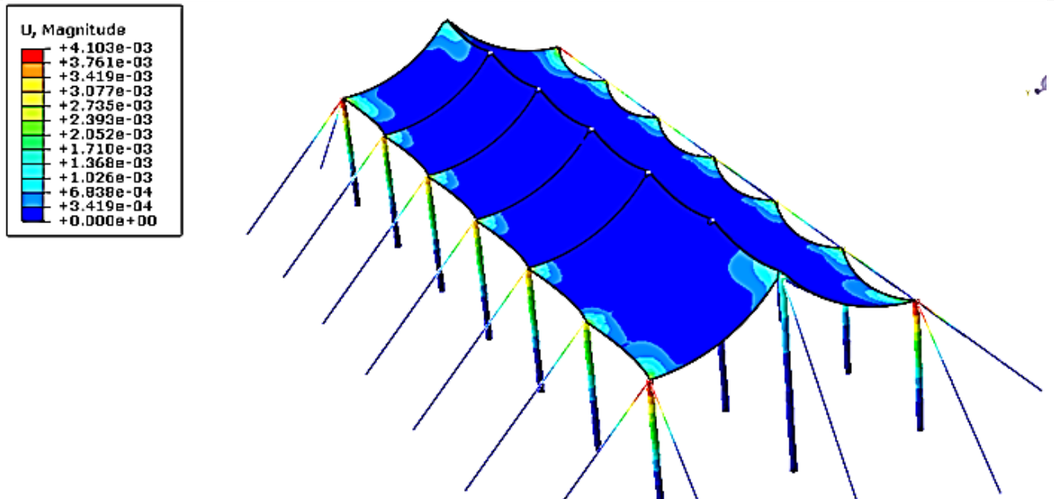
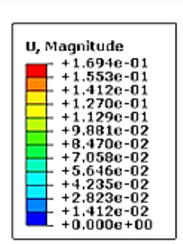
Black Tent elements Von Mises stress is 0.208MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements Von Mises stress is 5.04 x 10^{-3} MPa due to rain pressure applied to the tent (fabric model)	Black tent ele
		
Black Tent elements displacement rate is 163 mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 0.3419 mm due to rain pressure applied to the tent (fabric model)	Black Tent
		

Table 29 E: Modeling of the Tribe No. 5. Golestan Province Black Tents, arrangement by author

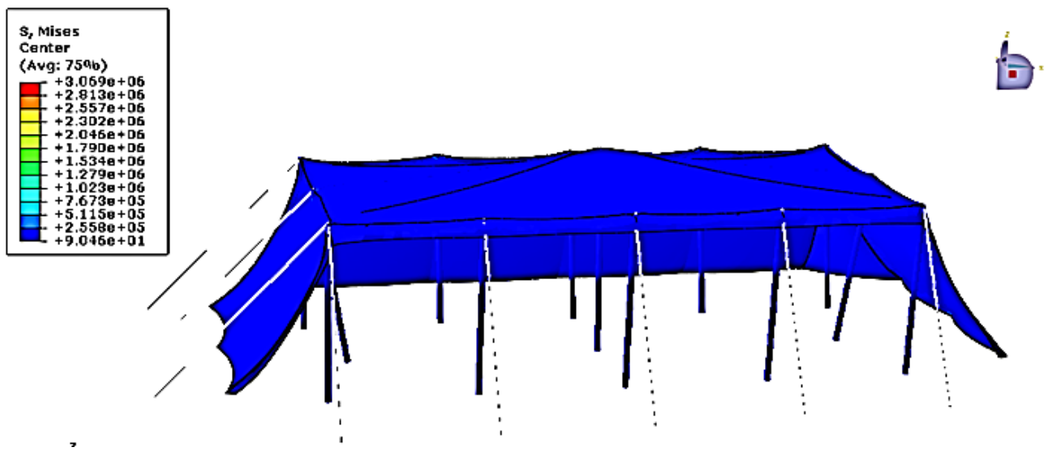
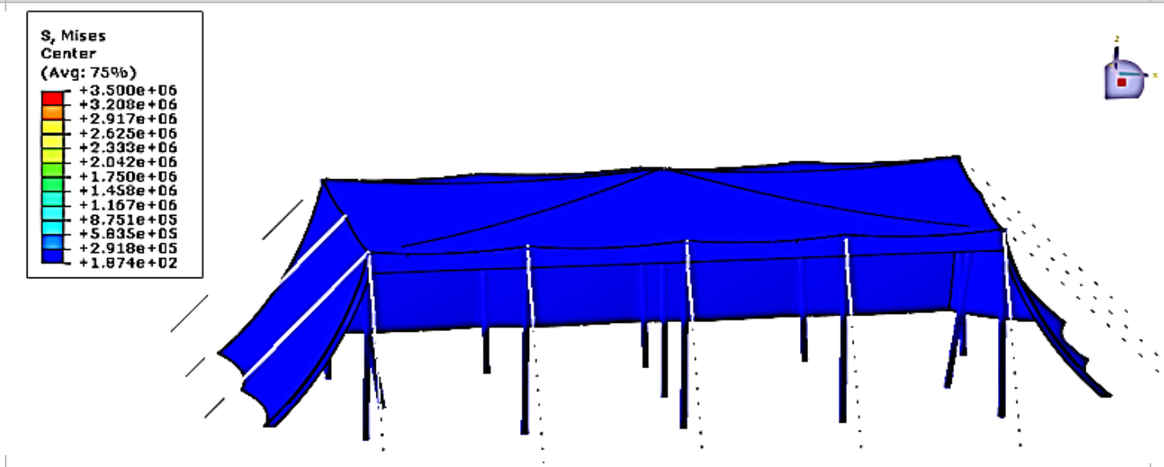
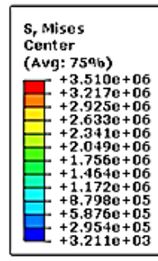
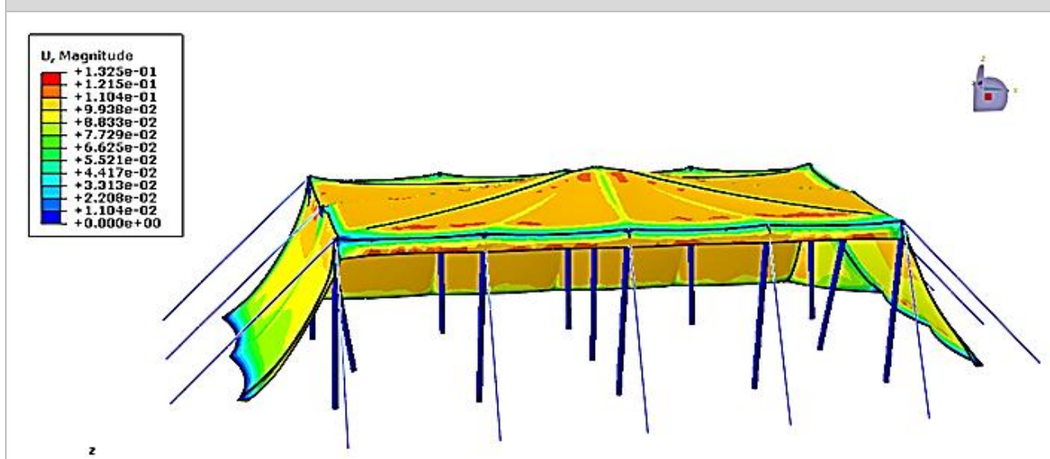
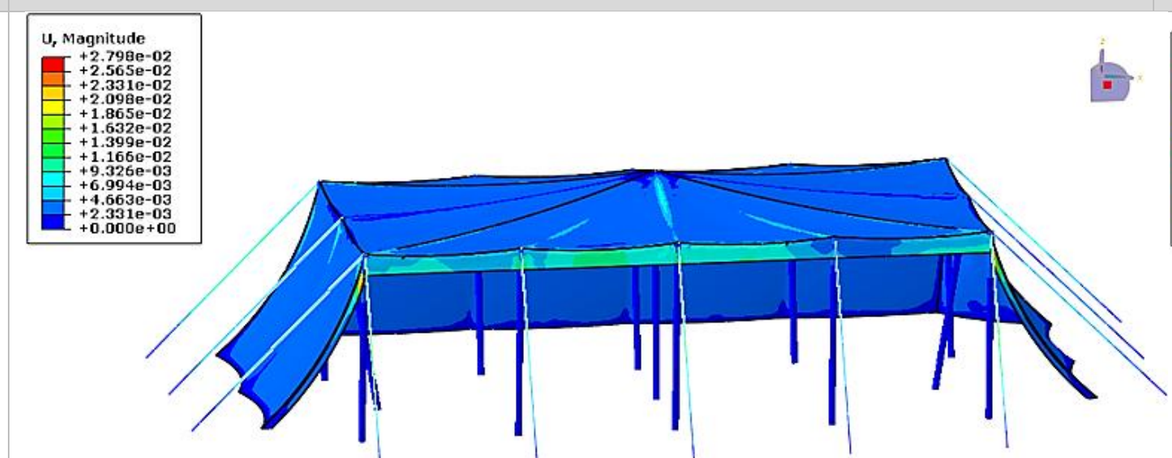
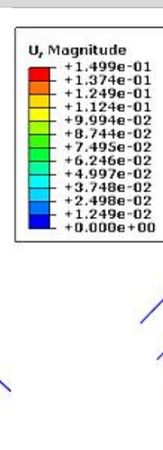
Black Tent elements Von Mises stress is 0.51 MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements Von Mises stress is 0.58 MPa due to rain pressure applied to the tent (fabric model)	Black Tent
		
Black Tent elements displacement rate is 99.3 mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 7 mm due to rain pressure applied to the tent (fabric model)	Black Te
		

Table 29F: Modeling of the Tribe No. 6. Sistan Province Black Tents, arrangement by author

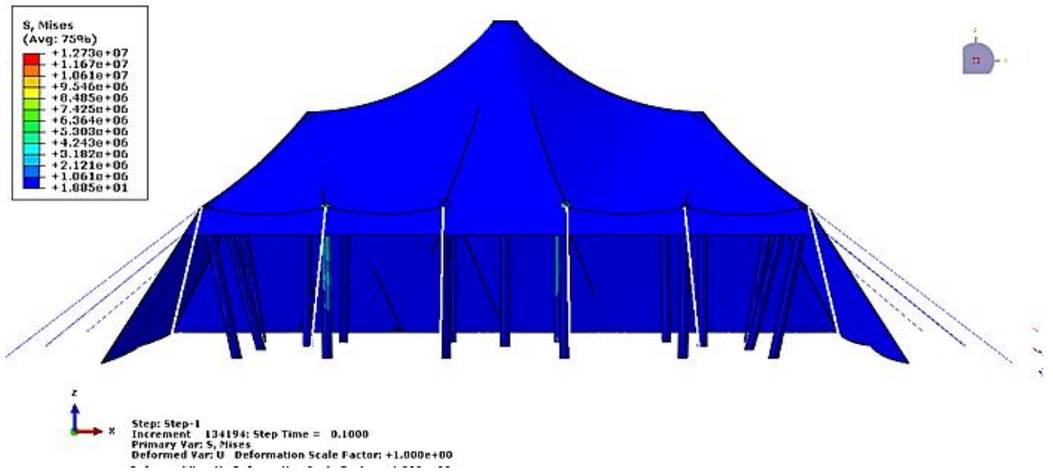
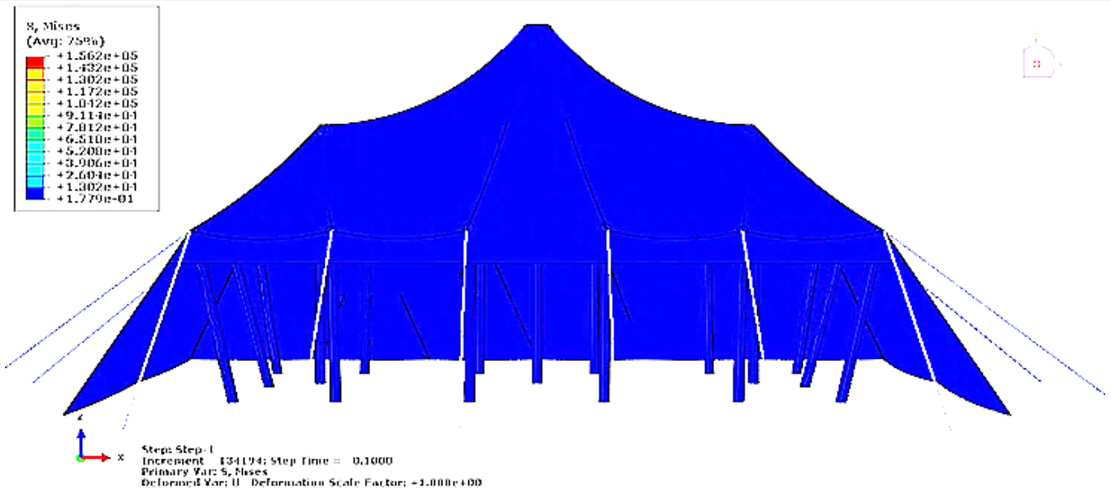
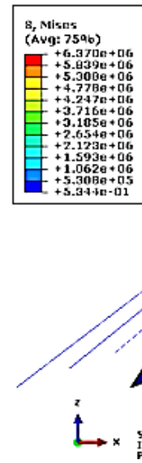
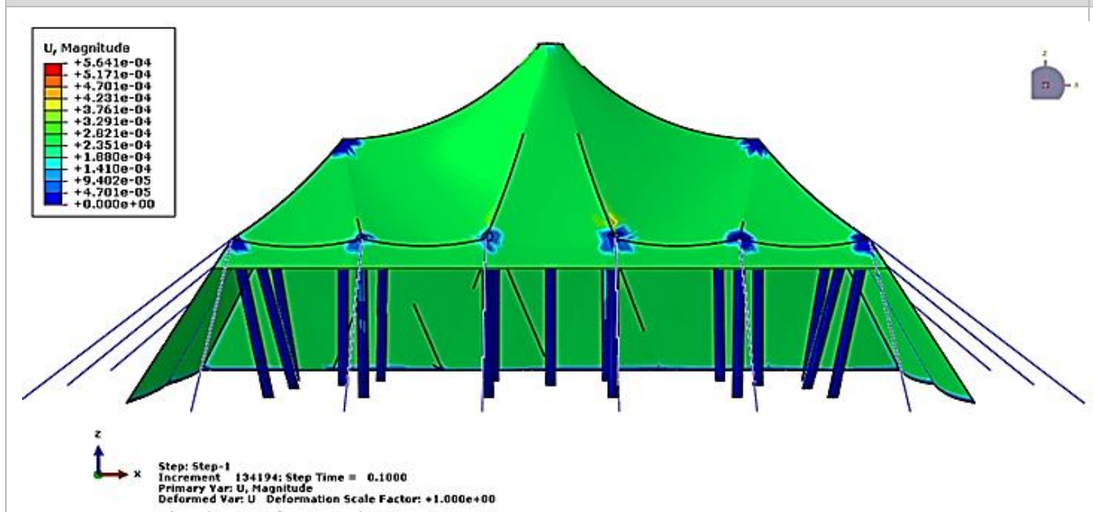
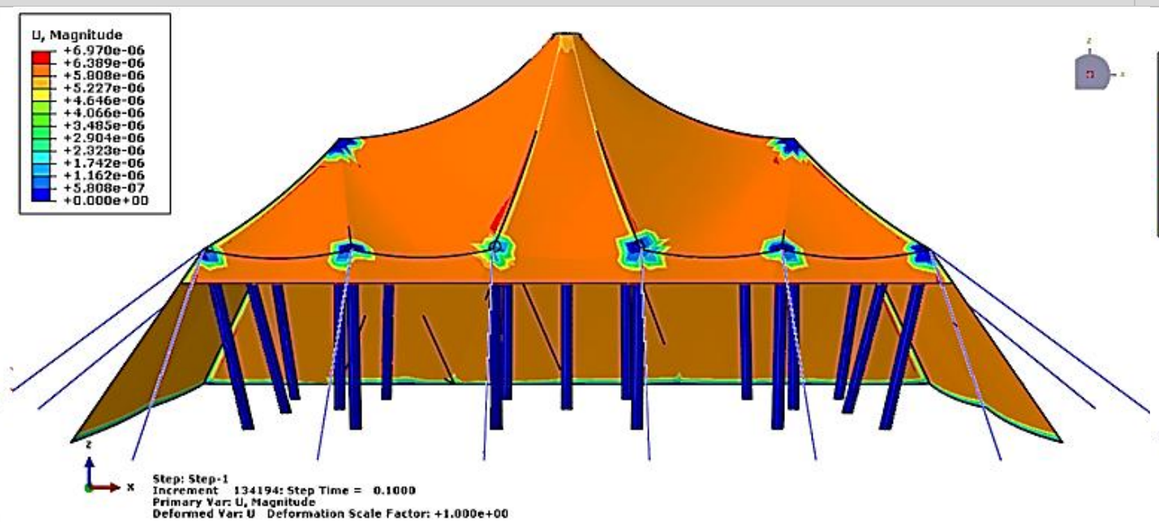
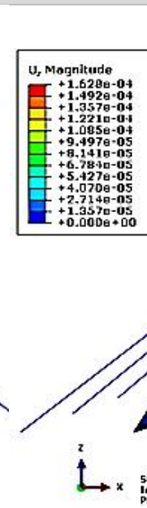
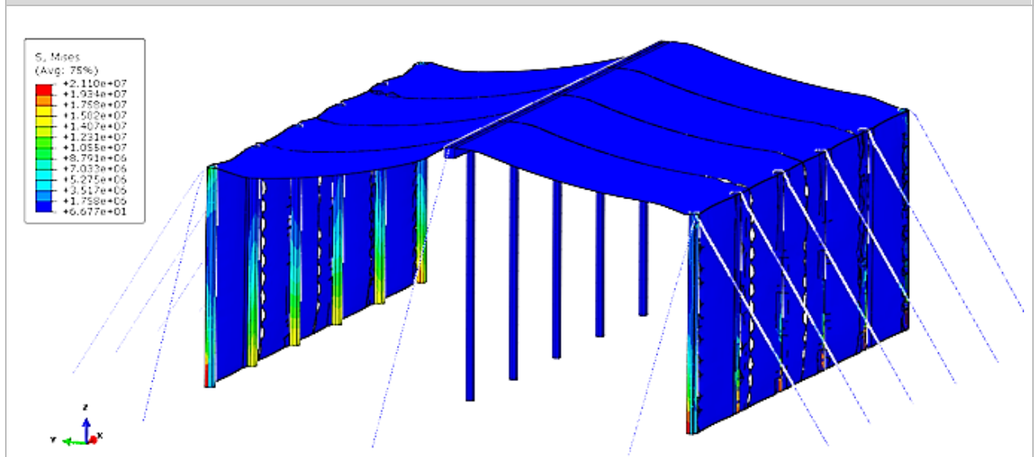
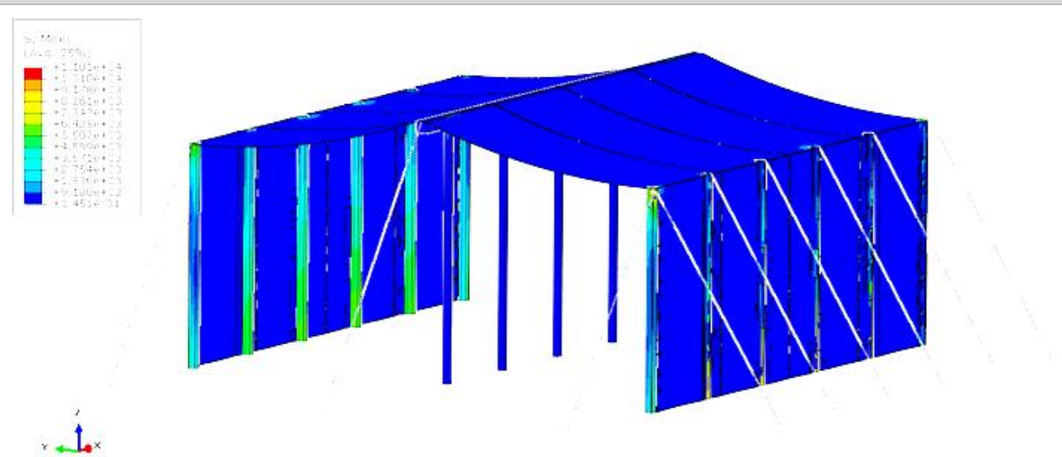
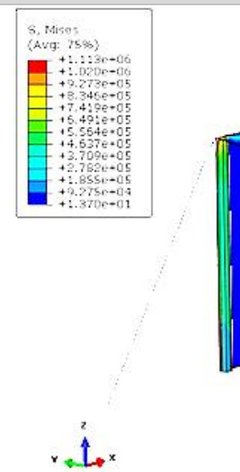
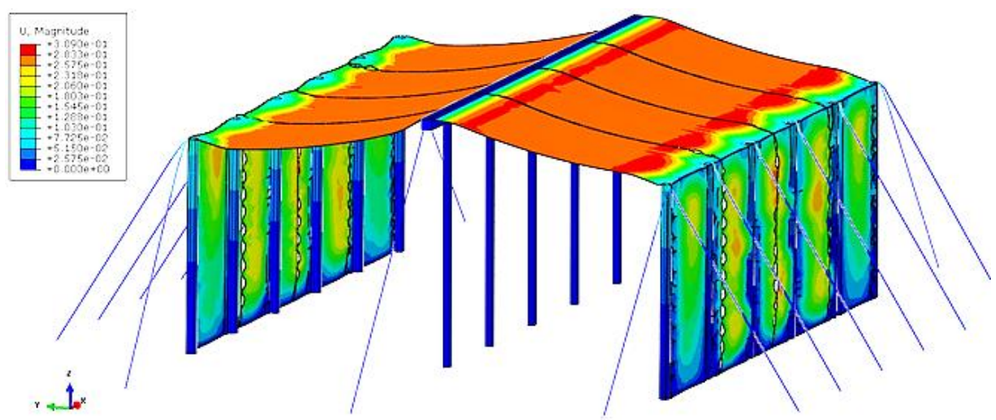
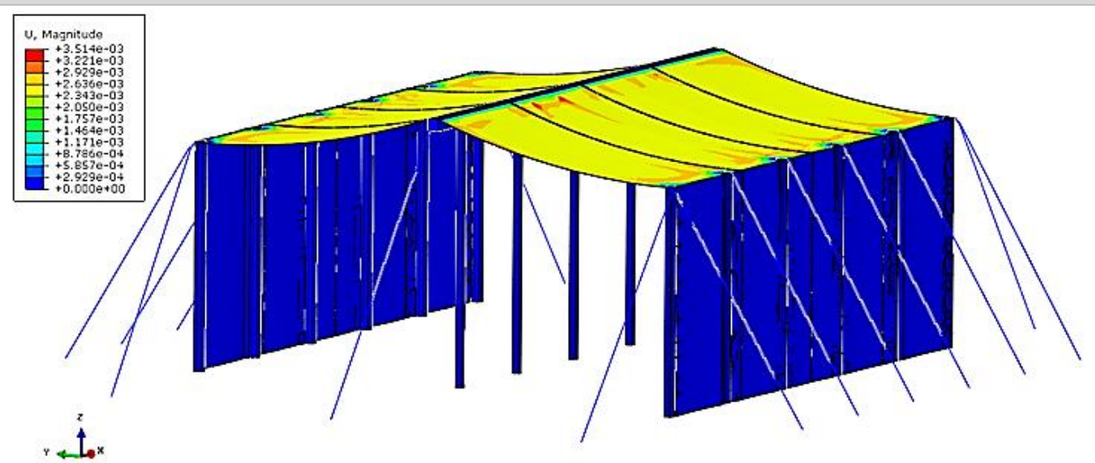
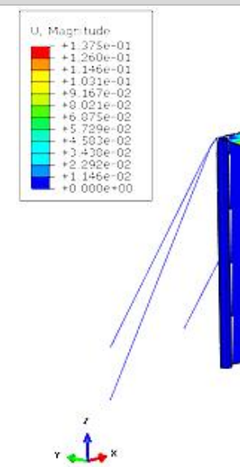
Black Tent elements,Von Mises stress is 2.12 MPa due to wind pressure applied to the tent (fabric model)	Black Tent elements ,Von Mises stress is 2.60 10^{-2} MPa due to rain pressure applied to the tent (fabric model)	Black
		
Black Tent elements displacement rate is 0.329 mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 0.00639mm due to rain pressure applied to the tent (fabric model)	Black Te
		

Table 29 G: Modeling of the Tribe No. 7. Kerman Province Black, arrangement by author

Black Tent elements,Von Mises stressis 3.517 MPadue to wind pressure applied to the tent (fabric model)	Black Tent elements,Von Mises stress is 1.836 x 10^{-3} MPa due to rain pressure applied to the tent (fabric model)	Black Tent ele
		
Black Tent elements displacement rate is 283.3 mm due to wind pressure applied to the tent (fabric model)	Black Tent elements displacement rate is 2.636 mm due to rain pressure applied to the tent (fabric model)	Black Tent e
		

6.8 Summary

The following conclusions can be made,supported by the research:

The cross struts (bracing) of the walls play important role in reduction of the tension of movement in the Tents covers. In roof covers the width of the strips of the fabric determines the distance between the ropes.

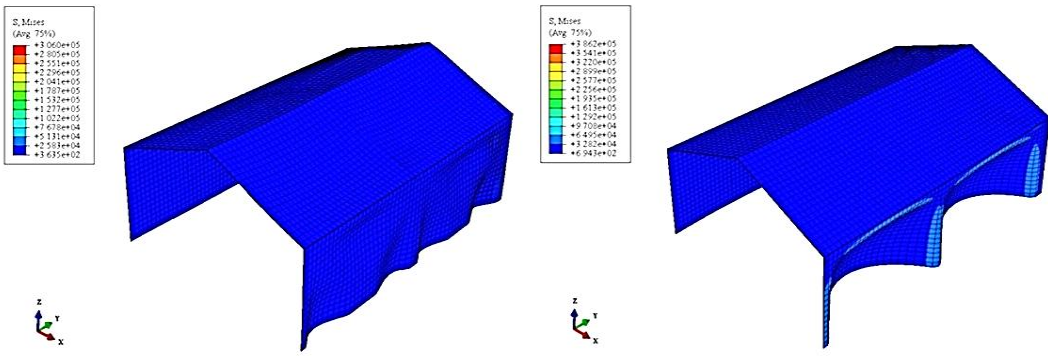


Fig. 189: Reaction of the tensions in the tent with lateral vertical posts and bracings (cross struts) and without and the bracings,model by author

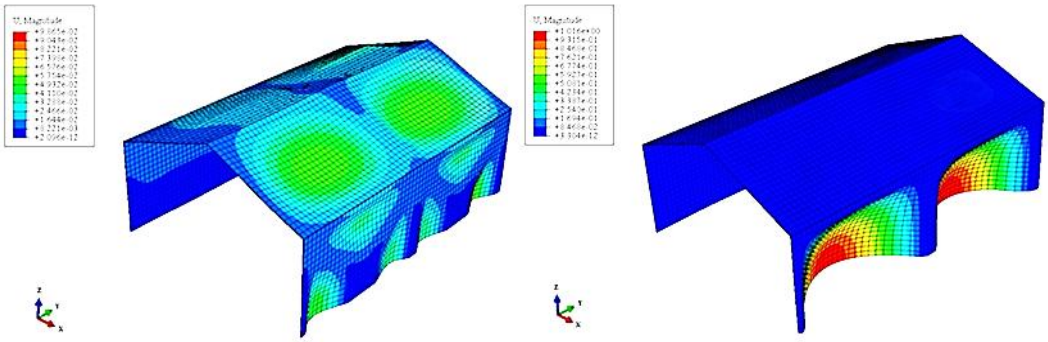


Fig. 190: Absolute value of displacement of the cover with lateral vertical posts and bracings (cross struts) and without the bracings, model by author

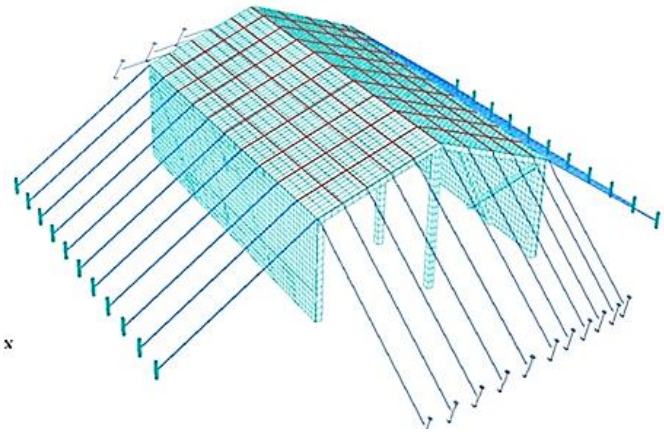


Fig. 191: Dependence of the widths of the roof cover strips and the distances between the holding ropes that form the grid (the mesh), model by author

The strips of the covering fabric are 60-80 cm wide and the distances between the ropes are the same. The ropes form a grid (a mesh) responsible for carrying the loads. The load distribution in the two directions must be balanced. If either of them increases or decreases, the stability of the tent is endangered. The mesh network is a technology invented and applied by the nomadic people and it was formed by a long experience. This is exactly the way in which advanced soft wares analyse and recognize the quality of fabrics.

The main difference in behaviourof the Black Tents fabric and the other fabrics results come from its loose structure–the spaces between the fibres cause less pressure on the fabric from the wind. Thus, the force imposed on the structures is decreased too. Quality of goats' hair fabric shows two significant advantages: it postpones fabric rupture and also it increases the whole structure durability and resistance. Goats' hair fabric shows higher durability in wind, rain and snowfall than the other fabrics used for tents. On a sample that was modelled and analysed in the Chapter 6.7.3this point was significant, as the displacement rate in Black Tent fabric is only 34% of displacement in other non-porous tent fabrics (Fig. 179 - Fig. 180). The most important point is that the maximum stress imposed on the Black Tent fabric is less than 2% of non-porous tent fabrics.

Finally, in the Chapter 6.7.4. all seven types of the Black Tent were modelled. The displacement rates and Von Mises stress values of the tents surfaceswere calculated for wind loading and rainfall pressures they encounter. Due to the lack of snowfall, the snow load calculation was omitted.Nevertheless, the diagrams for such cases were included.

According to the climatic situation of each of the seven analysed tribes, the displacement rates of the tents proved to be insignificant and stability of the BlackTents is not threatened by the climatic occurrences which they meet in their area.

7 RESULTS OF THE RESEARCH

7.1 Compliance of diversified types of the Black Tents with geographical and social conditions of the seven Iranian nomad tribes

Black Tents built by the nomads from different parts of Iran have different characteristics.

In course of the research on the Black Tents built by seven tribes living in different climatic conditions, physical, mechanical and structural features of theirTents were compared and modelled. Woven covers were checked against wind, storm, rain, snow and local phenomena common for the regions.

In all the provinces,the Tents acquired modifications necessary for living in different weather conditions. They were adapted to high and low temperatures. Although their structure seems simple, the Black Tents implement interesting heating-and-cooling system due to the covers made of goats'hair and flexibility of the construction. Basic scheme of the Tent remains the same, each tribe modified it to obtain maximum comfort with minimum load to carry on the trail. The structures are made of timber, which varies according to local types of trees. Covers are weaved in the same way, but the strips of fabrics joined according to the weather conditions. There are several ways of putting up the Tent and dismounting it.Artistic decorations that through the country, but all of them are prepared with wool: light and re-usable. In theTents'structures, natural and vernacular materials are used in a way exposing their technical qualities and craftmanship of the tribesmen. Comparative analysis of the Black Tents in the different regions of Iran has confirmed compatibility of structural, functional and aesthetical character of the Tents with the local climate and tribal folklore.

The Black Tent is a four season dwelling place, modified throughout the country to resist different temperatures, rainfalls, and to provide conditions necessary for living in it. Additionally, static strength and durability of the Tent is great. Use of goats' hair woven by the nomad women guarantees keeping appropriate loose structure and dark colour for many years. Nomadic women are active participants in shaping nomads' architecture: from weaving the fabric, *chigh*s and weaving ropes, to pitching tents.

Attention of nomadic people is concentrated on flexibility of interiors of theirn Black Tents where functional parts are separated by movable furnishings, indispensable properties anddecorations, making it a house. The place for cooking, a small kitchen is arranged inside (or outside in summer), and sleeping space, granary, and other functional areas are separated with bags, saddlebags, additional bedding and other belongings not needed in a moment.

What is more, the Tents are brightened with artistic decorations that differ throughout the country. They are made with natural and materials, which in them display innovative new qualities.

As it was mentioned during the research, tribe No.1 Qashqai Tribe in Fars Province was the first case in this study and for this tribe the fabric of the tent was analysed from technical side.All nomads tent fabrics are prepared in the same way, but the structures of the tents differ throughout the country. Therefore, in the further research, the first and the second modelling wasperformed to assess the tents' durability in a border

weather situations. These were obtained from the analysis carried in the Chapters 3.2.-3.3. The results were presented in theChapters 6.7.1- 6.7.2.
As to the first modelling discussed in the Chapter 6.7.1., the tent structure included inclined lateral posts (braces) withstandingthe wind load. The results were shown in the Table 26.

In the second modelling discussed in the Chapter 6.7.2., the same tent structure was analysed in two situations: covered with the black tent fabric (made of goat hair) and covered by the Hyper Elastic model fabric. The comparison is available in the Table 30 and it indicates that the goats'hair fabric cover is performing better in the conditions endured by the tents than the man-made fabrics.
Modelling comparisons were made for rain and wind loads and based on the climate charts prepared in the Chapter 3, Table 18. Due to the lack of snowfall in the regions of the nomads' residence,calculations for this factor were not made.
In the Chapter 6.7.3., Table 29A-F, all the types of the tents were modelled with the natural (goats hair) material cover.The numeral results of the overall, average of Von Mises stress on the Black tents walls and roofs, and displacement rates exerted on them during the rainfall and winds, show that the Tents' structures arestrictly adapted to the weather conditions they are exposed to.
This applies also to the forms of the tents: they are different in different regions of the country. This feature was an answer to the winds and rains in different seasons and in different locations. The tents are erected across prevailing winds and their form helps to decrease the pressure on the structure.

Table 30: Comparative data of the displacements of the same structure covered with different fabrics, by author

Modeling results	Wind load		Rainfall load	
	Von Mises stress	Maximum displacement rate	Von Mises stress	Maximum displacement rate
Black tent covered with Hyper-elastic fabric	$8Mpa$	50 cm	$1Mpa$	28 cm
Black tent covered with fabric made of goats hair	$3Mpa$	12 cm	$0.3Mpa$	15 cm

The research was based on modeling the variety of locally used Black tent structurescovered with the goats hair fabric and, in comparison, with Hyper-elastic fabric. These models underwent exposure to extreme wind and rain loads specified in the earlier parts of the research. Computer programme allowed to assess the displacements of the structures. It was proved that the structures coveredwith natural fabric provide safety and this is why the nomad people use these structures for their home building.

7.2 Compliance of the results of the research with the Thesis of the Dissertation

The Thesis of the research put forward several not obvious statements, which in course of analysing successive problems were answered.

Historical research has proved that the Black Tent has long-lasting tradition and it was seen in distant times in many areas that now belong to Iran. Diversification of took place in distant regions and over a long span of time These regions had different climatic conditions, but the main common feature of the tribes was herding and animal breeding. The tribes' way of living was subordinated to this. Moving from place to place entailed constructing and improving the Black Tent. Improving with aim to adapt it to encountered weather condition which differ through the country and nto the everyday life. **Therefore, it is true that the tribal cultures in Iran arose from a thousand years' tradition.**

Now there are many types of the Black Tents – seven of them were analysed in the most important aspects of function and construction. Analysis of the layouts of the Tents has shown that although they have common features, the spaces in the interiors are arranged in a different way among the tribes. The differences include summer and winter changes in the disposition of basic family occupations and entertainments. Sometimes even the shape of the Tent is changed because of seasonal temperature and precipitation differences. The fact, that twice a year the Tentsare folded and unfolded in a different place, means that their structure is adaptable as its interior is.**Flexibility of the Black Tents' structures is adjusted to diversified climate and it emerges from nomadic life.**

Analysis of the structures of the Black Tentsconducted with digital tools and contemporary technologies has uncovered that differences in the Black Tents shapes, sizes are strictly connected with the climate. Due to experience, skill and inventiveness of the tribesmen the Tents used in the areas with milder weather are built just for such weather occurrences – not a harsher weather. It is interesting that on contrary to a variety of Tents' structures, the fabric made of Iranian goats' hair remains the same for all the tribes. The answer was brought by laboratory tests, which confirmed its idiosyncratic qualities, not matched by any other fabrics.**Building crafts were perfected within the tribes using local materials, which created the Tents' structures strictly adapted to climatic situation of the regions where they live.**

Some more subjects were analysed to obtain the main targets of the research.

The trails of the tribes were examined. Their locations, differences of levels and climatic occurrences. Phenomenons such as temperatures, precipitation and wind forces were compared in the tables and created the basis for the specific knowledge which allowed further research. In this light the shapes, sizes and heights of the discussed Tents supported the expectations with the mathematical data.

Further research pertained to the activities connected with the Tents' construction, upkeep and the way of living of the tribes. In this case the data was collected by the

author who participated in constructingthe Tent from the very beginning and arranging the interior with the belongings brought by the family. In a similar way the data on the sizes and the details of construction was gathered by the author from the other tribesmen.Simultaneously the diversity of constructions of the Black Tents was analysed,as well as the methods of erecting them. Maintenance problems of the Tents were recognized, as the elements wear out in adifferent rate.

Developed typology of the Black Tents of the seven tribes, experiencing different geographic situations and adhering to their traditions, provides ground for protection and conservation of the Black Tents and support of nomadic life in Iran.

The results of the research comply with the thesis of the dissertation. The research which was carried out opens several paths for further investigation, concerning spatial interrelations between the tribes and research on reasons for some outstanding solutions in the Tents'constructions.

7.3 Perspectivesof traditional Iranian nomads' habitat

The way of living of the nomadic tribes in Iran is characterized by being on the move: assembling, dismantling their tents, carrying along all the necessities with them on the trail. The houses (Black Tents) are subjects to the culture, livelihoods, economy and technology of thetribes communities. The lives and habitats are adapted to climatic-geographic conditions of the trails.

For a few decades, due to political, safety and welfarereasons more permanent settlements for the tribes were set in villages or around the cities. This resettlement policy implemented in some regions of Iran have not yielded any results, and the migration culture is still very active and mobile in some places (Moeni M., 2008. p. 47-50).

Preservation and interpretation of historical vernacular architecture contributes to the heritage and culture of Iran. Lack of support from relevant agencies will gradually lead to sedentary lifestyle of nomad tribes entailing loss of historically established cultures, including loss of their shelter, the Black Tent. This research is aimed at completing documentation on constructions, methods of transferring the homes and crafts that were developed in course of the centuries, when many nomad tribes were on the trail twice a year. This research presents typology of the Black Tents of Iranian nomad tribes and proves idiosyncrasy of their achievements in many fields.

Another goal of the research was to create basis for methods of conservation of historical nomad shelters and passing over this knowledge to posterity.

It was also aimed at recognition of the perspectives of continuation of nomadism in contemporary world, maybe on slightly different basis.

Nowadays people in Iran have different idea of nomadic life, it seems exotic to them. There are organized events such as assembling the Black Tent structure, exhibitions of nomadic hand craft, but they take place in exhibition halls. Although such actions have their educational power, it would be much better to organize them in the open, which will encourage the nomads to show their real way of living and made people from cities aware of the legacy of their culture.

The way to conservethe nomadic life and to animate their culture is to encourage tourism.Co-habitation and sharing everyday life with some of the families of the tribes in time of holidays for small groups or families would be an interesting and enriching

experience. Staying in the open, in unpolluted lands,learning about animals and plants, taking part in everyday chores may become a fashion and then a habit.

7.4 Conservation of Black Tents – threats and perspectives

Elements of nomadic cultureand architecture should be preserved, but also interpreted in design, fashion, architecture. The aim is to make it present in an everyday culture.
Contemporary policies aim at sedentary life of the tribes. This will endanger the culture, including the loss of the traditional house – the Black Tent.
The goal is to conserve historical settlements and transmit their function.
The goal is to conserve historical trails and the sttlements landscapes.

8 ABSTRACTS (English, Persian, Polish)

The great expanse of East and Central Asia, the Middle East and North Africa witnessed many forms of coexistence of peoples, including nomadic tribes.Wandering is the basis of the life of such groups that have existed since the beginning of mankind.Many studies point to geographic, political and socioeconomic factors as the reason for the formation and development of this way of life in the Iranian Highlands.Among them, the geographic factor had a decisive influence on the fact that breeding became the main occupation of people.Many nomadic tribes still live in Iran today.During their journey, they take their houses with them, moving them from summer to winter stay and back.The houses were adapted to their lifestyle and geographic conditions.Hence it can be concluded that this portable and flexible structure has been used by nomads from the earliest times.

This study focused on the habits and way of life of nomads, but their homes were of interest.

Iran is located in the Middle East and its large area is characterized by a very varied topography.The climate is similarly diverse, so the nomadic tribes occupy territories with very different conditions.Various natural environments meant that the tribes, adapting to the conditions for generations, differentiated the ways of building tents and arranging them.Tribes that make a living by raising cattle go with herds to areas where fodder can be found.They have few items to handlebecause of the necessity to move.The tents in which they live are simply furnished, and each item that is there usually performs several functions.The tents themselves, called Black Tents, are made of cloth woven from long black goat hair.Tent constructions have been refined over the centuries, and due to the fact that they appear in different parts of Iran, they are very diverse.They represent high craftsmanship and contribute to the cultural heritage of Iran.

The tribes of nomads also developed their own system of beliefs and rituals resulting from them.Costumes, products and ornaments constitute an important and varied element of Persian culture.The research explored the construction of the Black Tents and the way of shaping the space in which family life takes place. It concerned the architectural forms of tents, structures and materials from which they are erected, as well as interior furnishings and objects that determine their character.Due to the area of the country and the dispersion of the tribes, seven of them were selected, wandering in different topographic and climatic conditions.These conditions were analysed in detail and made it possible to determine the extreme and average weather phenomena for the summer and winter whereabouts of the seven tribes. Comparisons were made between their tents.

The methods used in the research include descriptive analysis and graphical presentation of the test results.The inquiry was conducted in libraries, archives and institutions and using official websites.The author also conducted drawing and photographic inventories of tents and everyday life of nomads.She participated in the migration (participant observation) and conducted interviews with representatives of the nomadic community.Laboratory tests of the next phase of work have been documented with printouts and presentations of the sets of devices used in the research.Further analysis was carried out using advanced software computer programmes, such as 3DMax, ABAQUS and other professional civil engineering digital tools allowing to obtain comparable results.The research results and summaries of their individual phases are presented in the form of maps, charts and tables.

The life of nomads has already been the subject of research, however mainly from a social point of view.

The research conducted by the author for the first time concerns the physical and mechanical side of solutions used in the tents.
As a result of macroscopic studies, it turned out that the fabric with which the structures are covered (Chador), which is woven by women, is the same for all tribes. Women also erect and dismantle tents before and after the journey and so have an influence on their construction. The analysis of the dimensions and forms of the discussed seven types of tents from different parts of the country showed large differences, which is evidence of creativity and engineering thinking.
The next step of the research was to check to what extent the stability of each tent is adjusted to the climatic situation in which it is used. For this purpose, models were created in the ABACUS program. Their responses to wind and rain loads have been studied. It has been confirmed that the tents are strictly adapted to the conditions in which they are used. Their diversification is the result of the experience of many generations of nomads: observing the routes they traveled and the materials they could use. Tests of tent models covered with hand-made goat hair fabric showed that it is more useful for strengthening the structure of the tent and protecting its interior than fabrics used today for a similar purpose.
The Black Tent is one of the least known elements of Persian culture. Recent decades have not been favorable to the nomadic community, and without support and continuous research this culture may perish. The first step should be to understand the unique technology and culture that these tribes have created.
The right step, which has already taken place, was to register the Black Tent of Qashqaie tribe from the Fars province in 2012 as an intangible cultural heritage of Iran, promoted by author, and hope this thesis can be useful for other levels of conservation and preservation of this heritage.

چکیده

منطقه وسیعی از آسیای شرقی و مرکزی ، خاورمیانه و شمال آفریقا شاهد اشکال مختلف زیستی از جمله مهاجرت و به ویژه نحوه زندگی قبایل عشایری بوده است. مهاجرت یکی از رایج ترین اشکال زندگی عشایر است که از زمان شکل گیری زندگی اجتماعی بشر در دوران باستان ادامه داشته است. مطالعات مختلف نشان می دهد که عوامل جغرافیایی ، سیاسی و اقتصادی اجتماعی بر شکل گیری و توسعه سبک زندگی عشایری در فلات ایران تأثیر داشته است. در این میان، تأثیر جغرافیا و اقتصاد دامی مهم ترین عامل در زندگی عشایری است. عشایر ایران از قبایل مختلفی هستند که در سراسر ایران به صورت پراکنده زندگی می کنند. در هنگام مهاجرت ، آنها مسکن خود را از منطقه تابستانی به محل اقامت زمستانی منتقل می کنندو در نهایت برمی گردند. این مسکن با جغرافیای سبک زندگی آنها سازگار شده است. به همین دلیل می توان بیان نمود، که متحرک ترین مسکن در دوران گذشته توسط قبایل کوچنده استفاده می شده است.

در این تحقیق سعی شده است زندگی عشایر ایرانی در جنبه های مختلف از زندگی آنها به اختصار بررسی شود ، اما بیشترین تمرکز روی خانه های آنها است. ایران در منطقه خاورمیانه واقع شده و سرزمینی وسیع با تنوع جغرافیایی است. هر گوشه و کنار این کشور شرایط آب و هوایی متفاوتی دارد. ایران دارای قبیله هایی کوچ نشین در مناطق مختلف است. مناطق اقامت آنها متفاوت است و کوچ نشینان در طول تاریخ آموخته اند و سعی می کنند از قدرت طبیعت استفاده کنند و آن را تحت کنترل خود درآورند و همچنین از طبیعت تا آنجا که ممکن است در تعامل با زندگی خود استفاده کنند.

قبیله های عشایری که زندگی آنها بر پایه پرورش گاو بنا شده است، برای یافتن علوفه برای دام های خود نیاز به کوچ دارند. این امر زندگی آنها را چنان ساده کرده است که می توانند در سکونتگاه های موقت زندگی کنند. این سکونتگاه ها دارای طراحی هوشمندانه و معماری بومی هماهنگ با الگوی مهاجرت هستند. عشایر از چادر به عنوان خانه خود استفاده می کنند. طراحی خانه آنها که از اجداد به ارث رسیده است ، امکان برپایی و برچیدن چادرهای آنها را به روشی ساده و کارآمد فراهم می کند. این خانه ها در ایران "سیاه چادر" نامگذاری شده اند ، زیرا پارچه چادرها از موهای بلند و سیاه بز تهیه می شود. این ساختار برای قرن ها مورد استفاده ، کامل ومتنوع و نشان دهنده دستاوردهای صنایع دستی محلی عشایر است. سیاه چادرها به عنوان میراث فرهنگی ایران شناخته شده است ، زیرا قبایل جدا از کار ساخت چادرها ، سنت ها، فرهنگ و عقاید خود را ایجاد کرده اند. همچنین علاوه بر زندگی عشایری ، نحوه لباس پوشیدن ، جشن ها و آداب و رسوم آنها بخشی از سنت و فرهنگ ایرانی را تشکیل می دهند.

در این راستا تلاش پژوهشگر براین بوده است تا این سیاه چادر نسبتا ساده را بررسی کرده و تمام مواردی که یک فضا برای خانه بودن لازم دارد را مورد تحقیق قرار دهد. از جمله فرم معماری، مصالح، سازه، فضاها و طراحی داخلی سیاه چادر. با توجه به گسترگی جغرافیایی ایران و پراکندگی اقوام عشایر،۷ قبیله مختلف در اقصا نقاط این کشور انتخاب شده بود. تا بتوان علاوه بر بررسی سیاه چادرهای مختلف، مقایسه ای هم بین آنها داشت

روش تحقیق توصیفی تحلیل می باشد. گردآوری داده های تحقیق از لحاظ نظری شامل مطالعات کتابخانه ای ، بایگانی ها ، صفحات وب رسمی و تجزیه و تحلیل و بررسی متون است. از لحاظ عملی مبتنی بر فعالیتهای میدانی ، مشارکت نویسنده در کوچ چندین قبیله، طراحی، عکس، فیلم و مصاحبه های ضبط شده با کوچ نشینان است. اطلاعات مربوط به ساختار ، مواد ، فرایندهای ساخت و آزمایش های کنترل کیفیت مواد ، مدل سازی و تجزیه و تحلیل در نرم افزارهایی مانند 3DMax ، ABAQUS و سایر ابزارهای دیجیتال مهندسی سازه، امکان دستیابی به نتایج قابل مقایسه را فراهم کرد.

زندگی عشایری بسیار مورد مطالعه قرار گرفته است. اما هیچگاه به چادرهای آنها به عنوان خانه نگاه نشده است و اصولا سیاه چادر را نوعی سکونتگاه موقت می نامند. اما چطور این سازه می تواند قرن ها پابرجا و مورد استفاده باشد و تمام نیازهای زندگی انسان را در طول شبانه روز برآورده کند اما خانه نامیده نشود؟

برای اولین بار در این پژوهش مواد اصلی ساختار این سیاه چادرها مورد تحلیل از نوع فیزیکی مکانیکی قرار گرفت. در تمام این قبایل پوشش چادر از موی بز و به صورت یکسان بافته می شود. این پوشش ها توسط زنان قبایل بافته می شود. زنان نقش مهمی درساخت این سازه و برپایی آن دارنددر ادامه، معماری سیاه چادر ها در نقاط مختلف کشور به لحاظ فرم و ابعاد و طراحی پلان داخلی مورد بررسی قرار گرفته است. در نهایت تیپولوژی زیبایی از فرم را نشان داد که مبنی بر خلاقیت عشایر استبرای گام بعدی و دلیل مهمی که می تواند نشان دهده این باشد که آیا واقعا این سازه می تواند به عنوان خانه اتلاق شود یا خیر، سعی شد پایداری چادر در شرایط مختلف آب و هوایی بررسی شودهر ۷ سیاه چادر در نرم افزارABACUS مورد تجزیه و تحلیل و مدل سازی قرار گرفته اند. عکس العمل و واکنش این مدل ها در برابر فشار باد ، باران و برف در اقلیم مختلف اندازه گیری شده است.

در نهایت مشخص شد که این سیاه چادرها در شرایط مختلف آب و هوایی قابل استفاده و مقاومت هستند. اگرچه عشایر قرن هاست که از این چادر استفاده می کنند ، اما این مطالعات این نتیجه را دربر دارد که این فضا شایسته نامیدن خانه است. سیاه چادر یکی از آخرین عناصر شناخته شده در فرهنگ انسانی و همچنین ایرانی است. این سازه نیاز به شناخت ، خلاقیت و داشتن دانش بی نظیر از مواد بومی و محیط طبیعی مسیرهای کوچ آنها دارد. متأسفانه ، در طول چند دهه گذشته، آنها از طرف دولت حمایت نشده اند و این فرهنگ غنی نادیده گرفته شده است. برای حفاظت و پشتیبانی از نیازهای زندگی عشایر ، شناخت کامل فناوری بومی عشایر لازم است. سیاه چادر بهترین و مناسب ترین خانه و متناسب با ساختار زندگی عشایر است. برای اولین گام حفاظت این سازه در سال 2012 ، سیاه چادر عشایر قشقایی در استان فارس توسط نویسنده در لیست میراث فرهنگی ناملموس ایران ثبت شد و امیدوارم که این پایان نامه بتواند برای سایر سطوح حفاظت و حفظ این میراث مفید باشد.

Abstrakt

Wielka przestrzeń Wschodniej i Centralnej Azji, Bliskiego Wschodu i Północnej Afryki była świadkiem wielu form współżycia ludów, a wśród nich przemieszczały się plemiona nomadów. Wędrówka jest podstawą życia takich grup, które istniały od początków ludzkości.

Wiele badań wskazuje na geograficzne, polityczne i socjoekonomiczne czynniki, jako powód ukształtowania się i rozwoju tego sposoby życia na Irańskiej Wyżynie. Wśród nich czynnik geograficzny wywarł decydujący wpływ na fakt, że hodowla stała się głównym zajęciem ludzi. W Iranie żyje do dziś wiele plemion nomadów. Podczas wędrówki biorą ze sobą domy, przenosząc je z miejsc pobytu letniego do zimowego i z powrotem. Domy zostały dostosowane do ich trybu życia i warunków geograficznych. Stąd można wnioskować że ta przenośna i poręczna konstrukcja była używana przez nomadów od najdawniejszych czasów.

W badaniu zwrócono uwagę na obyczaje i sposób życia nomadów, ale przedmiotem zainteresowania były ich domy.

Iran leży na Środkowym Wschodzie i jego wielki obszar charakteryzuje się bardzo zróżnicowaną rzeźbą terenu. Podobnie zróżnicowany jest klimat, toteż plemiona nomadów zajmują tereny o bardzo różnych warunkach. Różne środowiska naturalne spowodowały że plemiona dostosowując się przez pokolenia do warunków zróżnicowały sposoby budowy namiotów i urządzania ich.

Plemiona, które utrzymują się z hodowli bydła podążają ze stadami na tereny gdzie można znaleźć paszę. Mają mało przedmiotów, którymi posługują się, między innymi przez konieczność przenoszenia się. Namioty, w których żyją są urządzone prosto, a każdy przedmiot, który tam znajduje się pełni zazwyczaj kilka funkcji.

Same namioty, nazywane Czarnymi Namiotami (Black Tents) wykonane są z tkaniny utkanej z długich czarnych włosów irańskich kóz. Konstrukcje namiotów były udoskonalane przez wieki, a w związku z tym że występują w różnych częściach Iranu są one bardzo różnorodne. Reprezentują osiągnięcia rzemiosła i współtworzą kulturowe dziedzictwo Iranu.

Plemiona nomadów rozwinęły także własny system wierzeń i obrzędów z nich wynikających. Stroje, wyroby, ozdoby tworzą istotny i zróżnicowany element kultury perskiej.

W badaniach podjęty został temat konstrukcji the Czarnych Namiotów i sposobu kształtowania przestrzeni, w której toczy się życie rodziny. Badania dotyczyły form architektonicznych namiotów, konstrukcji i materiałów z których są wznoszone i również wyposażenia wnętrz i przedmiotów, które decydują o jego charakterze.

Ze względu na obszar kraju i rozproszenie plemion wybranych zostało siedem z nich, wędrujących w różnych warunkach topograficznych i klimatycznych. Te warunki zostały szczegółowo opracowane i pozwoliły na określenie ekstremalnych i średnich zjawisk pogodowych dla letnich i zimowych miejsc pobytu siedmiu, wybranych do analizy, plemion. Między ich namiotami przeprowadzone zostały porównania.

Metoda jaką zastosowano obejmuje analizę opisową i przedstawienie graficzne wyników badań. Kwerenda prowadzona była w bibliotekach, archiwach i instytucjach, korzystała z oficjalnych stron internetowych. Autorka przeprowadziła również inwentaryzacje rysunkowe i fotograficzne namiotów i codziennego życia nomadów. Uczestniczyła w migracji (obserwacja uczestnicząca) prowadziła wywiady z przedstawicielami społeczności nomadów. Badania laboratoryjne kolejnej fazy pracy zostały udokumentowane wydrukami i przedstawieniami zestawów urządzeń wykorzystanych w badaniach. Dalsza analiza prowadzona była z zastosowaniem zaawansowanych programów komputerowego soft-ware'u, takiego jak 3DMax, ABAQUS i innych

profesjonalnych, zdigitalizowanych narzędzi mających zastosowanie w budownictwie, a pozwalających na uzyskanie porównywalnych wyników. Rezultaty badań i podsumowania poszczególnych ich faz przedstawione zostały w formie map, wykresów, tabel.

Życie nomadów było już przedmiotem badań, jednak głównie ze społecznego punktu widzenia. Badania przeprowadzone przez autorkę po raz pierwszy dotyczą fizyczno-mechanicznej strony rozwiązań jakie stosuje się w konstrukcji namiotów.

W wyniku badań makroskopowych okazało się, że tkanina, którą są okrywane konstrukcje (Chador) jest taka sama dla wszystkich plemion. Kobiety, które ją tkają również wznoszą i demontują namioty przed i po podróży, toteż mają wpływ na ich konstrukcję. Analiza wymiarów i form omawianych siedmiu typów namiotów pochodzących z różnych części kraju wykazała duże zróżnicowania, świadczące o kreatywności i inżynierskim myśleniu. Kolejnym etapem było sprawdzenie na ile stabilność każdego namiotów jest dostosowana do sytuacji klimatycznej, w której jest używany. W tym celu zostały sporządzone modele w programie ABACUS. Ich reakcje na obciążenie wiatrem i deszczem zostały zbadane. Potwierdzone zostało przypuszczenie, że namioty są dostosowane ściśle do warunków w jakich są używane. Ich dywersyfikacja jest wynikiem doświadczeń wielu pokoleń nomadów: obserwacji szlaków, które przemierzali i materiałów z których mogli korzystać. Badania modeli namiotów pokrytych tkaniną ręcznie wykonaną z włosów kóz wykazały jej większą przydatność dla wzmocnienia konstrukcji namiotu i ochrony jego wnętrza niż współczesne tkaniny używane w podobnym celu.

Czarny namiot jest jednym z najmniej dotąd poznanych elementów perskiej kultury. Ostatnie dekady nie były przychylne dla społeczności nomadów, a bez wsparcia i ciągłych badań kultura ta może zginąć. Pierwszym etapem powinno stać się zrozumienie unikalnej technologii i niepowtarzalnej wartości, którą stworzyły te plemiona.

Właściwym krokiem, który miał już miejsce, stało się zarejestrowanie, w 2012 roku, za sprawą autorki, Czarnego Namiotu plemienia Qashqaie z prowincji Fars jako niematerialnego dorobkukultury Iranu.

9 ANNEXES

9.1 Bibliography

1. ABAQUS/CAE user's guide, 23.4.1. Fabric material behaviour.
2. ABAQUS/CAE user's guide, 22.5.1. Hyper elastic behaviour of rubberlike materials.
3. Afshar Naderi, N., Bahmei tribe, Tehran University publication, Iran, 1968.
4. Akbari, A., Proceedings of the National Conference : Abandonment of the nomadic society of Iran, Vol 1. 8. 2004.
5. Baharvand Amanallahi, S., Pastoral nomadism in Iran, Ketab publication, Iran, 1981.
6. Bahman Beigi, M., Orf o adat dar ashayer-e Fars, Tehran, 1945.
7. Bakhtiari, S., Atlas of Iran, Geographic and Cartographic Gitashenasi Institute, Iran, 1984.
8. Badri, K., Karimi, H., Asgharian, A., Serious assholes. "Investigation of Tensile Properties of Ribbon Rings 1 * 1" Journal of Textile Science and Technology, 4th year, 1st year, 2008.
9. Black-Michoud, J., "An ethnographic and ecological survey of Lurestan, W. Persia" in : Middle Eastern Studies, May 1974, Vol. 10. No. 2.
10. Borqai, M., The stockman nomadism of the Turkashvand tribe, Bu Ali Sina University publication, Hamadan,1977.
11. Digard, J. P., Nomadism techniques, transl. Karimi, A., Iran 1990.
12. Dieulafoy, J. Dieulafoy Travelogue, transl. Farah vashi, H. Khayaam publication, Tehran, 1982.
13. Ebn Kaldun, Moqaddema, tr. M. Parvin Gonabadi, II, Tehran, 3rd ed., 1973.
14. Edwards, A. C., The Persian Carpet, London, 1953.
15. Fazlallah, Rashid-al-din. Jameʿ al-tawarikh, ed. A. A. ʿAlizada, I, Moscow, 1965.
16. Feilberg, C.G., La tente noire contribution ethnographique a l'histoire culturelle des nomads, transl. Karimi, A., Kobenhavn, Iran, 1980.
17. Frankopan P., The Silk Roads: A New History of the World, Bloomsbury, 2015.
18. Garthwaite, G. R., The Bakhtiari Khans: Tribal Disunity in Iran, doctoral thesis, University of California, Los Angeles, 1969.
19. Garthwaite, G. R., Pastoral Nomadism and Tribal Power, Iranian Studies 11, 1978.
20. Hassas, N., The Conservation of Black Tent in Fars Province, case study: Qashqai tribe, BA Thesis. 2012, Faculty of Conservation Architecture of Apadana University Archives, Shiraz, Iran, 2012.
21. Irons, W. "Nomadism as a Political Adaptation: The Case of the Yomut Turkmen," American Ethnologist 1/4, 1974.
22. Iranian Building codes and standards, Standards No, 2800, 6th Chapter.
23. Karimzada, M., Shahsevanha-ye Fars, Honar o mardom 13/ 137-138, 1974.
24. Kelm T., Architektura prerii i kanionów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2007
25. Kiani, M., Black tent, Kian publication, Shiraz, 2006.
26. Mardukh, M., Tarikh-eKord wa Kordestan wa tawabeʿ yatarikh-eMardukh, 4th ed., Sanandaj, 1972.
27. Minorsky, V., "The Gūrān," BSO(A)S 2, 1943.
28. Moeni, M. 'Study of the process of formation of nomadic housing.' Beautiful Art Journal, No. 33. 47-50. 2008.
29. Moshiri, R., Nomadic Geography (principales and Iran), ، Tehran: Samt Publication, Iran, 1983.
30. Najm-al-molk, A., Safar-nama-ye Ḵuzestan, Tehran, 1962.
31. Nik kholgh, A., Society of Iranian nomads, Iran, 1990.
32. Nomads Affairs Organization of Iran is a governmental organization Archive, Archive No:156/43/6

http://www.ashayer.ir/index.aspx?fkeyid=&siteid=8&pageid=479&newsview=5412

33. Nyka L, Szczepański J., Travelling Architecture: Vanishing heritage of Gypsy caravans in Poland, Journal of the International Society for the Study of Vernacular Settlements, e-journal, Vol. 6, no.2, March, 2019.

34. Peyman, H., Il-e Qashqai, Anstitue Taḥqhiqhat-e Behdashti.Tehran, 1968.
35. Popov, E. P., “Mechanics of Materials”, New York, Prentice-Hall, 1952.
36. Pups, A. A., Iranian painting forms, transl, Y. Azhand, Mola Publication, 2005.
37. Pur Karim, H., Kordan-e Bachlavanluʾi-e Quchan, Honar o mardom 88, 1969.
38. Qaem-maqami, J., Ashayer-e Ḵuzestan: Ṭayefe Mianab, Yadgar 2/4, 1945.
39. 61. Rapoport A., House Form and Culture, Englewood Cliffs, N.J.: Prentice Hall, transl, Afzalian, K.H, 1969,
40. Rawlinson, H,“Notes on a March from Zohab at the Foot of the Zagros along the Mountain Roads of Khuzistan (Susiana) and from thence through the Province of Luristan to Kirmanshah in the Year 1836,” JRGS 9, 1839.
41. Roshan, P.; " Functional Finishes for Textiles Improving Comfort, Performance and Protection", Woodhead Publishing Series in Textiles, Num.156, chapter 13, p.p. 395-436, 2015.
42. Salzman, P.C, "Movement and Resource Extraction among Pastoral Nomads: The Case of the Shah Nawazi Baluch," in: Anthropological Quarterly 44, 1971.
43. Sarrafi Nik, A., "Sustainability in Vernacular architecture-outlooks on Iranian tribes", in: 5th SASTech (Symposium on Advance in Science and Technology), Khavaran Higher-education Institute, Mashhad, Iran. May, 12, 2011. P. 502.
44. Safinezade, A., Aṭlas-e Ilat-e Kohgiluya, Moassasa-ye Motalaat, stenciled, Tehran, 1968.
45. Shibo, R., “ANALYSIS OF TENT STRUCTURES (Implementation of non-linear material behavior in membrane structural analysis)”, Master Thesis Project in Structural Engineering, at the Delft University of Technology, 2008.
46. Shojaei, A., Najib Nia, S., "The necessity of extension of Tent Structures in Iran", in: 5th SASTech (Symposium on Advance in Science and Technology) Khavaran Higher-education Institute, Mashhad, Iran, May, 12, 2011. p.130.
47. Spooner, B., Kuch and Baluch and Ichhyophagi, Iran 2, 1964.
48. Spooner, B., Religious and Political Leadership in Persian Baluchistan, doctoral thesis, Oxford University, 1967.
49. Steinbeck J., *The Grapes of Wrath, 1990.*
50. Tawahoddi. K., Ḥarakat-e tarikhi-e Kord “Ḵorasan,” Mashad, 1980.
51. Tobolczyk M., The Birth of Architecture, The Urban International Press, Gateshead UK, 2008,
52. White, F.M., “fluids mechanics”, McGraw-Hill, 2010.
53. Wilson, A. T., The Bakhtiaris, Journal of the Royal Central Asian Society, 1926.
54. https://fa.wikipedia.org/wiki
55. http://naturalhomes.org/timeline/shieling.htm
56. http://pixdaus.com/simulated-inuit-igloo-constructed-near-nome-alaska-see-comme/items/view/236582/
57. https://en.wikipedia.org/wiki/Shieling
58. https://en.wikipedia.org/wiki/Hafod_Uchtryd
59. https://maciejkowalski-birds.blogspot.com/2016/10/gruzjaarmeniaIII.html access 12.02.2021
60. https://www.nationalgeographic.org/encyclopedia/yurt/
61. https://repozytorium.kul.pl/bitstream/20.500.12153/941/1/Wawrzynczyk_Rafal_Przesladowanie_religijne_irackich_jezydow_przez_Panstwo_Islamskie_Przyczyny_przebieg_odpowiedzialnosc_wspolnoty_miedzynarodowej_za_ukaranie_sprawcow.pdf
62. http://countrystudies.us/iran/51.htm
63. https://en.wikipedia.org/wiki/Rashid-al-Din_Hamadani
64. www.fars news agency
65. http://www.mirzaie.loxblog.com/post/38
66. http://dostaneshahr.persianblog.ir/tag
67. http://caspian-nejat.mihanblog.com/post/48
68. http://www.ashayer.ir/index.aspx?siteid=1&pag eid=162
69. http://ashayer.ir/index.aspx?fkeyid=&siteid=1&pageid=160
70. https://againstthecompass.com/en/qashqai-people-iranian-nomads/
71. www.ashayer.ir/index

72. http://www.persiancarpetassociation.com/lori_carpet_111.JPG
73. https://www.destinationiran.com/nomads-of-iran.htm
74. www.destinationiran.com/nomads-of-iran.htm
75. http://ashayer.ir/index.aspx?siteid=1&siteid=1&fkeyid=&siteid=1&pageid=280
76. http://bayanbox.ir/info/945986881084180548/IMG-20140927-WA0021
77. http://ashayer.ir/index.aspx?siteid=1&siteid=1&fkeyid=&siteid=1&pageid=280
78. https://iranantiq.com/handicraft/felt/kapanak-felt-clothing
79. http://qashqai3da.blogfa.com/post/46
80. http://www.akairan.com/khanevadeh/model/news2016452332757042.html
81. https://www marde-bakhtiari-bernow.jpg
82. https://www.eligasht.com/Blog/travelguide/%D9%84%D8%A8%D8%A7%D8%B3-%D9%85%D8%AD%D9%84%DB%8C/#Clothing5
83. https://flightio.com/blog/travelling-in-iran/khorasan-clothes
84. http://jamejamonline.ir/online/2600731151112151311
85. https://www.kojaro.com/2016/11/26/123569/traditional-clothing-south-khorasan/
86. http://www.kalokan.ir/post/21
87. http://www.dana.ir/news/948178.html
88. https://seemorgh.com/culture/custom/63454-63454/
89. http://habib101270.mihanblog.com/post/85
90. http://rangvarehayeyekrang.ir/?p=5236
91. http://rangvarehayeyekrang.ir/?p=5236
92. http://www1.jamejamonline.ir/newstext.aspx?newsnum=100771340688
93. http://irimo.ir/far/wd/2703
94. https://www.irna.ir/news/82611745/304
95. http://www.dana.ir/news/1184604.html/-
96. www.fars news agency
97. www.aliexpress.com/item/1000001258889.html
98. www.aliexpress.com/item/1000001258889.html
99. http://www.tjprc.org/publishpapers/2-29-1535005850-1IJTFTOCT20181.pdf
100. https://rochi.ir/mag/%D9%86%D9%85%D8%B1%D9%87-%D9%86%D8%AE/
101. https://blog.faradars.org/surface-tension/

9.2 Index of Figures

9.3 Index of Tables