BASHKIA PEQIN

UJESJELLES KANALIZIME RAJONI ELBASAN SH.A

RELACIONI TEKNIK

Objekti:
Rikonstruksion i Ujesjellesit te Fshatrave Trash,Karthnek,
Nj.Adm.Sheze, Bashkia Peqin

Autor i Projektit

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2024

P E R M B A J T J A

1. DETYRA E PROJEKTIMIT

OBJEKTI: *" Rikonstruksion i Ujesjellesit te Fshatrave Trash,Karthnek, Nj.Adm.Sheze, Bashkia Peqin".*

VEND NDODHJA: Njesia Administrative Sheze, Bashkia Peqin.

QELLIMI: Furnizimi me uje 24 ore i fshatrave: Sheze, Pekisht, Trash dhe Karthneke, te Njesise Administrative Sheze, Bashkia Peqin, parashikuar kjo edhe per 20-25 vite.

TE DHENAT KRYESORE:
Hartimi i projektit të objektit: Rikonstruksion i ujesjellesit per grupfshatrat e lartepermendur te Njesise Administrative Sheze, Bashkia Peqin, sipas V.K.M. Nr 704 , datë 29.10.2014.

1. Konsiderata te Pergjithshme.

Njesia Administrave Sheze ndodhet ne jug te Bashkise Peqin dhe siperfaqja e saj eshte afersisht 22 km² dhe perbehet nga rreth 2980 banore. Zona e cila do te perfshihet ne projektin e rehabilitimit te rrjetit te ujesjellesit perbehet nga 4 fshatra te Njesise Administrative Sheze, Bashkia Peqin si me poshte:

- Fshati Sheze
- Fshati Pekisht
- Fshati Trash
- Fshati Karthneke

Nr.	Njësitë administrative të Bashkisë Peqin	Qytetet dhe fshatrat në përbërje të Njësive administrative	Popullsia e shërbyer
6	Shezë	Sheze	360
		Pekisht	1110
		Trash	835
		Karthneke	360
		Algjinaj	315

Tabela Referuar Vendim Nr.26 dt 31.05.2019 Enti Rregullator i Sektorit te FU.

Njesia Administrave Sheze eshte nje zone ne pergjithesi e karakterizuar nga nje terren kodrinor dhe nje pjese e saj eshte zone fushore e cila ndodhet 12 km larg qendres se qytetit Peqin. Ne afersi te kesaj zone kalon lumi Shkumbin ne bazenin e te cilit jane vendosur te dy stacionet aktual te pompimit qe furnizojne me uje te kater fshatrat e lartepermendur.
Te kater fshatrat jane vendosur ne menyre te tille ku permes tyre kalon rruga nacionale qe lidh Qytetin e Peqinit me ate te Belshit.
Qendrat e banuara jane shtrire pothuajse ne te gjithe territorin e zones dhe aktiviteti kryesor i banoreve eshte bujqesia dhe blegtoria. Zona ka nje sistem te prapambetur te transportit rrugor, i cili po merr nje zhvillim intensiv vitet e fundit nepermjet ndertimit te disa akseve rrugore te cilet kane bere te mundur lidhjen ndermjet tyre te fshtrave te zones si dhe ndertimi i aksit qe e lidh kete zone me qte te qytetit te Belshit i cili perben nje atraksion te veçante turistik.

2. Burimet e furnizimit me uje.

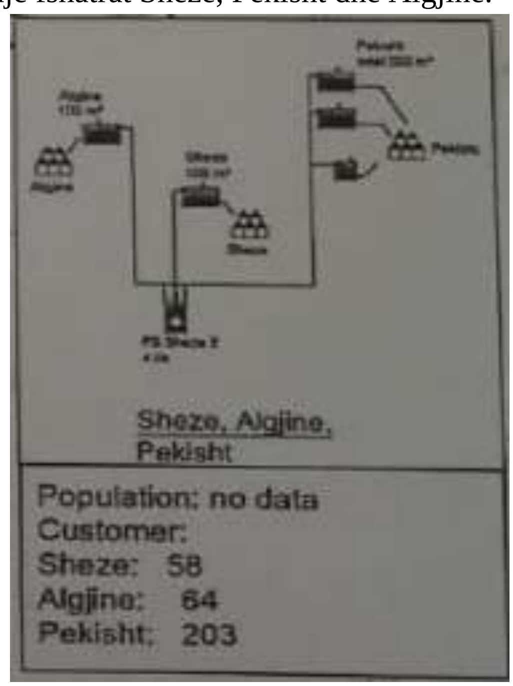
Aktualisht si burim kryesor furnizimi me uje per fshatrat e Njesise Administrative Sheze sherbejne dy burine ujore te ndidhura ne bazenin e lumit Shkumbin ne afersi te tij.
Aktualisht per momentin funksionojne te dy puset e ujit.
Pusishpimi Nr. 1 Karthnek (Sheza 1). Sipas informacioneve te marara nga stafi i Ujesjelles-kanalizime sh.a Peqin ky burim uji eshte ndertuar qe ne kohen e luftes ne vitin 1939 shume prane lumit shkumbin ne nje kuate 40 m m.n.v.
Duke qene se niveli dinamik i ujerave te nentokes ne kete zone eshte relativisht i ceket, zgjidhja e zhfrytezimit te ketyre ujerave eshte bere nepermjet nje pompe centrifugale horizontale te vendosuar ne stacionin e pompimit, i cili eshte nje strukture beton - arme. Nga shfrytezimi i ketij pushpimi prodhohen 3 l/sek uje i cili furnizon fshatrat Trash dhe Karthnek.

Skema Ekzistue se PusShpimit Nr.1 (Sheza 1)

Ky PusShpim furnizon me ane te stacionit te pompimit Depon ekzistuese V=50m3 Karthnek dhe Depon V=100m3 Fshati Trash.

Thellesia e tij eshte shume e vogel rreth 4 - 5 m dhe niveli dinamik i tij eshte 2-3 m.

Pusishpimi Nr. 2 (Sheza 2), i cili ndodhet ne fshatin Sheze, dhe ndodhet ne afersi te lumit Shkumbin ne nje kuote 35 m m.n.v., eshte instaluar nje pompe zhytese, e cila prodhon afersisht 5-6 l/sek dhe furnizon me uje fshatrat Sheze, Pekisht dhe Algjine.



Ky PusShpim furnizon me ane te stacionit te pompimit Depon ekzistuese V=100m3 Sheze , Depon V=200m3 Fshati Pekisht dhe Depon V=100me Fshati Algjine.
Pra, fshatrat e Njesise Administrative Sheze aktualisht kane dy sisteme te furnizimit me uje te pamvarur nga njeri-tjetri dhe furnizojne perkatesishtsecili nga dy fshatra. Pusi Karthnek (Sheze 1) furnizon me uje fshatrat Trash dhe Karthnek dhe pusi Sheze 2 furnizon me uje fshatrat Sheze ,Pekisht dhe Algjine.
Duke qene se Rrjeti I Fshatit Algjine eshte rikonstruktuar 5-vjecarin e fundit nuk do jete pjese se detyres se projektimit per realizimin e rikonstruksionit te rrjeteve te tubacioneve te tij.

Stacioni i pompimit 6 l/sek Sheze 2


Stacioni Pomipit 3 l/sek Karthnek Sheze 1


3.Stacionet e pompimit.

Aktualisht, ne skemen e furnizimit me uje uje per fshatrat Sheze, Pekisht, Trash dhe Karthneke te Njesise Administrative Sheze kemi dy stacione pompimi. Pervec godines se vogel ku ndodhet pusi Karthneke, i cili eshte nje strukture beton - armeje gjysem i zhytur nen toke, te dy stacionet e pompimit ne pergjithesi jane me mure tulle te suvatuar. Nga ana konstruktive ne pergjithesi te dy godinat e stacioneve te pompimit si dhe paisjet elektromekani jane pothuajse te amortizuar si pasoje e kohes se madhe qe ka kaluar qe nga ndertimi i tyre mbi 50 vjeçare.

Per sa i perket anes ndertimore si suvatimet, dyshemete, dritaret, instalimet elektrike dhe rrethimet mund te thuhet se jane ne gjendje tejet te amortizuar dhe kane nevoje per riparime te plota. Po ashtu mund te thuhet dhe per pompat dhe sistemin e tubacioneve, te cilat jane teresisht te amortizuara.

Ne stacionet e pompimit problem teper i madh eshte sigurimi i energjise elektrike me kabina te veçanta i pamvarur nga konsumatoret e tjere familjare dhe jofamiljare.

Stacionet e pompimit me poshte paraqiten stacionet e pompimit, pjese e sistemit te furnizimit me uje te fshatrave te Njesise Administrative Sheze.

3.1 Stacioni i Pompimit Karthneke. (Gjendja ekzistuese)

Ky stacion pompimi, siç kemi theksuar edhe me larte furnizon me uje fshatrat Trash dhe Karthneke. Karakteristikat e tij jane si me poshte:

Pompe centrifugale horizontale.

DIAMETRI I BRENDSHEM I PUSIT : D > 400 mm (Eshte si burim me thellesi 4 m)
Q= 3 l/sek OSE 10.8 m^3/ore
H= 180-170 m
MENYRA E LESHIMIT : Direkt
NR.I RROTULLIMEVE:n=3445rrot/min
FUQIA E ELEKTROMOTORIT: Pn=15 kW
TENSIONI I PUNES: 3X380 V NE TREKENDESH
Gjatesia e linjes St.Pompimi Karthneke- depo Trash eshte 2.5 km dhe gjatesia e linjes stacion Pompimi Karthneke -depo Karthnek eshte 1.8 km.
H-thithje=2 m.

3.2 Stacioni i Pompimit Sheze. (Gjendja ekzistuese)

Ky stacion pompimi, siç kemi theksuar edhe me larte furnizon me uje fshatrat Sheze dhe Pekisht. Karakteristikat e tij jane si me poshte:

Pompe Zhytese.

DIAMETRI I BRENDSHEM I PUSIT : D = 120 mm
Q= 6 l/sek OSE 21.6 m^3/ore
H=170-165 m
MENYRA E LESHIMIT : Direkt
NR.I RROTULLIMEVE:n=3445rrot/min
FUQIA E ELEKTROMOTORIT:Pn= 18 kW
TENSIONI I PUNES: 3X380 V NE TREKENDESH
Gjatesia e linjes St.Pompimi- depo Sheze 2 km dhe stacion Pompimi depo Pekisht 4 km.
Niveli dinamik ku punon pompa eshte: H-thithje=4.5 m.

Pamje te dhomes se pompave ne stacionin e pompimit Karthnek dhe Sheze.

Stacioni i Pompimit Karthneke.	Stacioni i Pompimit Sheze.
	

4. Rrjeti Kryesor dhe Shperndares.

Rrjeti kryesor transmetues ne pergjithesi eshte ndertuar me tubacione celiku, te cilet ne shumicen e rasteve jane te pambrojtur kundrej efekteve korroduese dhe rrjeti, si pasoje e vjetersise dhe nderhyrjeve pa leje paraqitet ne gjendje te amortizuar dhe nuk ben te mundur nje furnizim te rregullt me uje edhe pse nje pjese eshte zevendesuar edhe me linja polietileni. Gjatesia e pergjithshme e rrjetit kryesor te ujesjellesit te ketyre kater fshatrave (pa perfshire rrjetin shperndares) eshte 16.5 km linja kryesore.

Sic e kemi permendur dhe me siper, burimi kryesor i furnizimit me uje per fshatrat e Njesise Administrative Sheze jane burimet e ujerave nentokesore ne fushen e Karthnek-Sheze prane lumit Shkumbin.

Stacioni i Pompimit 3 l/sek furnizon me uje fshatrat Trash dhe Karthneke.

- Linja e dergimit nga stacioni i pompimit Karthnek- depo 45 m^3 Karthnek eshte 1.8 km material çelik DN 90 dhe amortizuar teresisht.
- Linja e dergim nga stacioni i pompimit Karthnek - depo 70 m^3 Trash eshte 2.5 km material çelik DN 90 dhe amortizuar teresisht.

Stacioni i pompimit Sheze 6 l/sek furnizon me uje fshatrat Sheze dhe Pekisht.

-Linja e dergimit stacioni i pompimit 6 l/sek Sheze - depo 120 m^3 Sheze DN 90 PE.

-Linja e dergimit stacioni i pompimit 6 l/sek Sheze - depo 100 m^3 Pekisht DN 90 PE 3 km dhe DN 90 çelik 1 km.

- Linja e furnizimit me uje e depos 75 m^3 Pekisht nga depo 100 m^3 Pekisht eshte DN 75 çelik.
- Linja e furnizimit te depos 60 m^3 Pekisht nga degezimi i linjes kryesore qe furnizon depon

100 m^3 Pekisht eshte DN 75 PE 750 ml.

Ne pergjithesi rrjeti shperndares eshte i ndertuar me tubacione celiku, ne shumeicen e rasteve i pahidroizoluar, tubacione celiku te xinguar dhe tubacione polietileni, keto te fundit te perdorur kryesisht vitet e fundit. Ka nevoje per permiresimin e matjes se ujit ne prodhim dhe ne dalje te depove per te pasur nje situate te qarte te bilancit te ujit.

Duhet te behet furnizimi i banesave me kaseta shperndarje. Duhet te pajisen me matesa te rinj te gjithe konsumataret pasi nje pjese e mire e tyre jane amortizuar dhe matja nuk eshte korrekte. Shpesh here kolektoret shperndares jane larg konsumatoreve, duke bere qe linjat furnizuese te kene humbje te konsiderueshme te ujit, duke marre parasysh ketu dhe materialin jo cilesor dhe jashte standarteve te ketyre tubacioneve.

Duhet te kihet parasysh edhe vendosja e impianteve te klorinimit pasi ne keto fshatra klorinimi kryhet ende me menyra mekanike tradicionale.

4. Depot e ujit.

Ne te kater fshatrat e larpermendur per te cilet kerkohet studim projektim i furnizimit me uje ndodhen 6 depo te shperndarje se ujit per furnizimi e banoreve te zones. Ato jane struktura beton-arme te amortizuara teresisht dhe kapaciteti i tyre nuk i pergjigjet kerkesave te konsumatoreve per uje.

Ne zone kemi keto depo:

- Depo 70 m^3 Trash qe furnizohet me uje nga Stacioni i pompimit 3 l/sek Karthnek.
- Depo 45 m^3 Karthnek qe furnizohet me uje nga Stacioni i pompimit 3 l/sek Karthnek.
- Depo 120 m^3 Sheze qe furnizohet me uje nga Stacioni i pompimit 6 l/sek Sheze.
- Depo 100 m^3 Pekisht qe furnizohet me uje nga Stacioni i pompimit 6 l/sek Sheze.
- Depo 75 m^3 Pekisht qe furnizohet me uje nga Depo 100 m^3 Pekisht.
- Depo 60 m^3 Pekisht qe furnizohet direkt me uje nga linja kryesore stacion pompimi Sheze - depo 100 m^3 Pekisht.

Theksojme se te gjitha saracineskat e komandimit dhe ato qe realizojne shperndarjen e ujit sipas linjave te furnizimit jane te amortizuar teresisht gje e cila shpesh ndikon ne uljen e presionit ne rrejet.

Gjithashtu, duhet theksuar se sot ne kete zone ka shume banesa qe nuk mbulohen me sherbimin e furnizimit me uje per arsye te zhvillimit te ndertimeve te reja kryesisht vitet e furndit.

Megjithe investimet sporadike te zhvilluara kryesisht ne vitet e fundit dhe punes se mire te bere nga stafi drejtue dhe punonjesit e U-K Peqin, humbjet e ujit qendojne ne nivele mbi mesatren e vendit (afro 65-70 %) si pasoje e se ciles edhe shoqeria qe administron kete zone te kete tregues jo te mire ekonomiko-financiar gje qe shpesh e ve perballe mungeses se likuiditeteve financiare. Prandaj nderhyrja ne ndertimin e ketij ujesjellesi eshte akoma edhe me e domosdoshme.

Pamje depo dhe puseta shperndarje Trash, Karthnek, Pekisht Sheze.




1.4.Popullsia. (numri i banoreve, konsumatoret e tjere)

Referuar te dhenave jane llogaritur numri i popullsise se Njesise Administrative Sheze, Bashkia Peqin, sikurse edhe zonave per rreth qe potencialisht mund te furnizohen nga ky ujesjelles dhe numri rezulton si me poshte:

Nr	Emertimi i fshatit. (Zones se banuar)	Popullsia aktuale Mars 2021. Numer banoresh.	Popullsia ne perspektive 2046. Numer banoresh.	Rritja e popullsise ne vit ne %.
1	Sheze	360	462	1.0
2	Pekisht	1110	1423	1.0
3	Trash	835	1071	1.0
4	Karthnek	360	462	1.0
	SHUMA	**2665**	**3418**	**1.0**

Duke menduar se keto fshatra ndodhen ne distance jo me shume se 15-20 km nga qyteti i Belshit i cili vitet e fundit eshte kthyer ne nje atraksion turistik, gjykojme se duhet marre ne konsiderate kjo detyre projektimi.

1.5.Shtrirja gjeografike.

OBJEKTIVI:

Objektivi i detyres se projektimit eshte hartimi i projektit te "Rikonstruksionit te magjistralit kryesor dhe rrjetit te brendeshem te furnizimit me uje te fshatrave: Sheze, Pekisht, Trash dhe Karthneke, te Njesise Administrative Sheze, Bashkia Peqin, sipas planimetrise bashkengjitur kesaj detyre projektimi.

- Te sigurohet sasia e nevojshme e ujit per numrin e popullsise ne prespektive, nepermjet rikonstruksionit te puseve ekzistues. kryesisht rritjes se thellesise se tyre apo edhe hapjes se puseve te rinj ne te njejten zone me ekzistuesit per te garantuar 24 ore furnizim me uje cilesore ne dite.
- Ndertimi i linjave te reja te dergimit dhe rrjetit shperndares per fshatrat e kesaj njesei administrative. Te behet e mundur qe linjat e tubacioneve te shtrihet ne rrugicat e lagjeve, te cilat duhet te parashikohen qe pas perfundimit te investimit te kthehen ne gjendjen e fillestare. Po ashtu duhet të parashikohet vendosja e

1635 matësave te rinj te ujit per te gjithe klientet si ata familjar, por edhe per bizneset dhe institucionet shteterore.

QELLIMI I PUNES:

Per realizimin e projektit, projektuesi duhet te rishikoje te gjithe informacionin ekzistues lidhur me projektin qe duhet te hartoje per furnizimin me uje sipas detyres se projektimit dhe te konsultohet me njesine e qeverisjes vendore te Bashkise Peqin qe ka nen administrim edhe Njesine administrative Sheze, sh.a. Ujesjelles-Kananalizime Peqin, OSSHE dhe Telekomin.

Studim -projektimi duhet te kete cilesi te tille ku nepermjet tij te plotesohet standarti i kerkuar dhe te plotesoje kushtet e projektimit. Te projektohet rrjeti i furnizimit me uje te Njesisise Administrative Sheze i perbere nga dy sisteme te furnizimit me uje sipas grupfshatrave qe e perbejne kete Njesi Administrative, me parametra te tille qe te mund te siguroje nevojen per uje te popullsise aktuale duke marre parasysh edhe rritjen e popullsise ne prespektive. Projekti te parashikoje zgjatjen e tubacionit dhe linjave te shperndarrjes ne afersi te tille qe te mund te kete akses lidhjeje per te gjitha banesat ne pusetat perkatese. Llogaritjet hidraulike te behen qe tubacionet te perballojne kapacitetin faktik dhe te prespektives.

TE DHENAT PER PROJEKTIM:

1. Popullsia aktuale e Njesise Administrative Sheze.
2. Shtesa natyrore e popullsise te merret 1.0 %.
3. Perspektiva e ujesjellesit te parashikohet per 20-25 vjet.
4. Norma per fryme te popullates te llogaritet sipas normave ne fuqi.
5. Materiali i tubacionit te jete PE-100.
6. Planimetria e rrjetit ekzistues.

KERKESAT QE DUHET TE ZGJIDHE PROJEKTI:

1. Te siguroje sasine e nevojshme te ujit per furnizim 24 ore ne dite te te gjithe zones se perbere nga fshatrat: Sheze, Pekisht, Trash dhe Karthneke, te Njesise Administrative Sheze, Bashkia Peqin duke bere rikonstruksion te puseve ekzistues ose ndertimin e puseve te rinj. Kjo sasi duhet te jete afersisht 8-9 l/sek. Duhet parashikuar vendosja e elektropomave te reja ne secilin stacion pompimi duke parashikuar minimumi nga nje elektropompe rezereve per te parashikuar rastet e defekteve te ndryshme.

2. Te realizoje shtrirjen e linjave te shperndarjes ne te gjithe hapesiren per te cilen do te realizohet projekti duke siguruar mbulimin 100% te zones me kete sherbim.

3. Te vazhdoje furnizimi me uje i ketyre kater fshatrave me dy sisteme te pamvarura furnizimi ashtu si eshte aktualisht.

4. Te parashikoje sipas llogaritjeve qe te ndertoje depo te reja dhe me kapacitet qe te perballoje jo vetem nevojat aktuale por edhe ato te perspektives.

Mendojme qe depot te jene te tilla:

-Nje depo 300 m^3 ne fshtin Pekisht ku eshte aktualisht depo 100 m^3 dhe te eleminohen te gjitha depot e tjera te ketij fshati.

-Nga nje depo 250 m^3 perkatesisht ne fshatrat Sheze, Karthnek dhe Trash. Depot e vjetra te dalin jashte funksionimit.

5.Te parashikoje vendosjen e matesave ne depo dhe stacione pompimi si ne dalje edhe ne hyrje te depove.

6. Te siguroje vendosjen e matesave te ujit per te gjithe konsumatoret familjare dhe jofamiljare nepermjet kasetave shperndarese te perbashketa.

7. Te parashikoje vendosjen e hidranteve per furnizimin me uje te mjeteve zjarrefikese ne raste te renies se zjarrit. Duhen parashikuar nga 4-5 paisje te tilla ne secilin fshat.

8. Te parashikoje vendosjen e impianteve te klorinimit me hipoklorit Natriumi (klor i lengshem) ne secilin stacion pompimi.

9. Projekti duhet te parashikoje punime per te ndertuar kabina elektrike per secilin stacion pompimi si edhe paisje te rregullimit te parametrave te tensionit elektrik. (Rregullator automatik te tensionit).

10. Duhet të parashikohet vendosja e matesave te rinje te ujit per te realizuar zevendesimin e tyre ne te gjithe klientet pasi nuk kane saktesi te matjes si rezultat i amortizimit nga koha e gjate e montimit te tyre. Lidhjet te parashikohen te veçanta per secilin klient dhe me kasete individuale gje e cila shton pergjegjesine e ruajtjes dhe kujdesit nga secili prej tyre.

11. Te ndertohen linja te reja te shperndarjes nga depo ne te gjithe fshatrat, sikurse te projektohet edhe rrjeti i ri i shperndarjes se ujit brenda secilit fshat. Te shihet mundesia qe linjat e tubacioneve te shtrihen ne rrugicat e lagjes, te cilat duhet te parashikohen qe te kthehen ne gjendjen fillestare.

12. Llogaritjet hidraulike te behen qe tubacionet te perballojne kapacitetet faktike dhe te prespektives edhe per rrjetin e brendshem.

13. Materialet qe do te perdoren, te jene sipas kushteve teknike te Projektimit dhe te Ndertimit te veprave te kesaj natyre dhe sipas standarte te BE.

Ne perfundim mund te thuhet se projektuesi duhet te konsultohet vazhdimisht me Bashkine Peqin perpara fillimit te punes per projektin, ashtu si edhe ne te gjitha fazat e projektimit dhe te zbatimit te tij dhe kjo si per garantimin e saktesise se bazes se te dhenave ashtu edhe per reflektimin e ndryshimeve te pritshme.

Perveç saktesise se te dhenave si me siper, projektuesi, perpara se te filloje punen per projektimin duhet qe paraprakisht:

1-Te beje relievin (azhornimin) e te gjithe zones se trajnuar, te jepet plani i piketimit (me pikat e forta etj);

2-Te marre te gjitha azhornimet e rrjetit te infrastruktures;

3-Projektuesi duhet te beje verifikimin paraprak ne terren dhe sondime per saktesine e te dhenave/ azhornimeve, per rrjetin e infrastruktures, perpara fillimit te projektimit. Kjo duhet ne menyre qe te evitohen pasaktesite gjate projektimit dhe zbatimit, si rezultat i te dhenave te marra qe nuk perputhen me gjendjen ne terren;

Ne baze sa me siper, kerkohet qe Projektuesi te organizoje punen e tij projektuese ne disa faza.

Mbasi te perfundojne azhornimet ne terren, verifikimet si dhe studimet e nevojshme, per te gjithe zonen qe perfshihet ne projekt, projektuesi ben nje analize te shkurter te situates dhe konsultohet me Bashkine Peqin, ku merr edhe te dhenat e para mbi ecurine e planeve/studimeve dhe ndikimin e tyre ne projektin e tij.

Projektuesi harton paraprakisht:

Skemen e rrjetit te furnizimit me uje

Hartimi i skemes shoqerohet me:

a.Relacion teknik;

b.Nje analize te situates ekzistuese, ne raport me efektet sociale qe mund te sjelle projekti ne drejtim te prishjes se ndertimeve dhe te elementeve te kosto-efektivitetit dhe te impaktit social, ekonomik, funksionar dhe mjedisor te nderhyrjes, duke percaktuar te gjitha prishjet, statusin e godines, pozicionin e tyre, kostot e pritshme per shkak te prishjeve, siperfaqen dhe vleren e perafert te objekteve qe prishen, si pjese e analizes se efekteve te pritshme. Objektet qe prishen do te identifikohen me vendnodhjen e tyre, (te shoqeruara keto me shkakun e prishjes dhe llojin e prishjes, pjeserisht, teresisht etj.), si edhe me te dhena individuale per cdo godine.

Qellimi i kesaj faze eshte qe Projekti te kete analize te perputhshmerise me planet, eficencen ekonomike te nderhyrjes, pra efektivitet te kostos, minimizim te impakteve negative sociale (si p.sh te prishjeve te panevojshme per kete faze etj.)

Hartimi i preventivit

Llogaritja e preventivit do te behet sipas normave dhe akteve ligjore ne fuqi per te siguruar kursimin dhe eficencen e perdorimit te fondeve.

Standartet

Standarte ne projektim

Projekti do te hartohet ne perputhje me te gjitha normat dhe standartet per projektimin qe parashikon legjislacioni ne fuqi. Projektimi duhet te siguroje respektimin e standarteve, madje edhe atyre gjate zbatimit. Eshte pergjegjesi e projektuesit saktesia dhe respektimi i standarteve dhe normave perkatese.

Projektuesi duhet te rekomandoje dhe prezantimin e standarteve te reja, per perafrimin me normat e BE-se, si edhe te praktikave me te mira nderkombetare ne projektim dhe zbatim. Rekomandimet duhet te permbajne elemente te realizueshmerise me praktiken shqiptare dhe limitimet per financimin e vepres.

Standarte ne paraqitjen e dokumentacionit teknik

Ne hartimin dhe paraqitjen e dokumentacionit te projektit, projektuesi te perdore programet e kerkuara kompjuterike, si dhe te nxitet perdorimi i programeve te reja, me te avancuara te fushes.

Ne hartimin, paraqitjen dhe miratimin e dokumentacionit teknik te projektit te kihet parasysh dhe te respektohen te gjitha kerkesat dokumentare dhe te paraqitjes qe parashikon Ligji "Per urbanistiken", Rregullorja e Urbanistikes dhe Legjislacioni ne fuqi.

Realizimi i projektit.

Faza e i (Projekt idese)

Paraqitja e varianteve te nderhyrjes, ne baze te rezultateve te vleresimit te skemes se furnizimit me uje, duke perfshire analizen e gjendjes ekzistuese te infrastruktures ne teresi dhe shfrytezimin sa me shume te jete e mundur te veprave ekzistuese.

Te paraqiten variantet e propozuara me preventivat paraprake e specifikimet perkatese duke perfshire dhe kostot e shpronesimeve, nese ka, per cdo variant.

Faza II (Projekt Zbatimi)

Te kryhet hartimi i Projekt-Zbatimit i objektit: *”Ndertim i Ujesjellesit te Fshatrave Trash, Karthnek, Sheze”,* i cili duhet te permbaje:

1- Raportin teknik
2- Hartimi i relievit topografik te zones ku do te nderhyhet (kordinata lokale, kuota absolute)
3- Planimetrine e zbatimit te rrjetit te furnizimit me uje;
4- Profilin gjatesor te te gjithe linjave te skemes;
5- Profilat terthore tip;
6- Projektin per pusetat e shkarkimit dhe te kontrollit;
7- Specifikimet teknike per zerat e punimeve qe do te kryhen;

Organizimi, plani i punes dhe stafi i kerkuar

Projekti do te kryhet ne bashkepunim te ngushte me Bashkine Peqin. Stafi qe kerkohet duhet te mbuloje:

- Inxhinier ndertimi
- Inxhinier hidroteknik
- Inxhinier gjeolog
- Inxhinier topograf
- Staf mbeshtetes per fushat e mesiperme.

Raportimi

I gjithe dokumentacioni do te paraqitet ne 3 (tre) kopje orgjinale, dhe ne 2 (dy) CD.

Llogaritjet, specifikimet teknike dhe preventivi.

Relacioni teknik qe shoqeron projektin duhet te permbaje:

- Llogaritjet statike te strukturave;
- Llogaritjet hidraulike per linjat e tubacioneve dhe vepren e pastrimit;
- Preventive i plote i kushtimit te vepres;
- Raportin e Vlersimit te Ndikimit ne Mjedis(VNM)

Paraqitja e vizatimeve

Vizatimet e projektit duhet te permbajne minimum fletet si me poshte:

1. Topografine e gjendjes ekzistuese ne Shk. 1:500 ose 1:1000;
2. Planimetrine e rrjetit te ujesjellesit ne Shk. 1:500 ose 1:1000;
3. Profilin gjatesor te linjave te tubacioneve Shk. 1:1000, 1:100;
4. Profilat terthore tip per cdo linje;
5. Profilat e puseve te furnizimit me uje;
6. Projektin per pusetat e shkarkimit dhe te kontrollit;
7. Projektin per detaje te ndryshme te nderprerjes te linjave te tubacioneve ne rruge dhe vepra ekzistuese te ujitjes dhe kullimit

2. Zgjidhja e Projekt Zbatimit

TE DHENAT:

1. Popullsia aktuale e Njesise Administrative Sheze eshte rreth 2665 banore.
2. Shtesa natyrore e popullsise te merret 1.0 %.
3. Perspektiva e ujesjellesit te parashikohet per 20-25 vjet.
4. Norma per fryme te popullates te llogaritet sipas normave ne fuqi.
5. Materiali i tubacionit te jete PE-100.
6. Planimetria e rrjetit ekzistues.

ZGJIDHJA E PROJEKTIT:

Per hartimin e ketij projekti eshte parashikuar qe fshatrat: Sheze, Pekisht, Trash dhe Karthnek, te Njesise Administrative Sheze, Bashkia Peqin te furnizohet me sasine e nevojshme te ujit te pijshem, sipas normave perkatese te miratuara. Eshte bere studimi per sigurimin e sasise se nevojshem te ujit prej 8-9 l/sek per sistemin e furnizimit me uje.

LLogaritja e Prurjeve

Nevojat per uje jane pranuar si me poshte:

- Konsumi i ujit shtepijak 150 l/db
- Konsumi i ujit hotele 20 l/shtrat, 100%
- Konsumi industrial i ujit 0.5l/s/ha
- Koeficenti ditor i jouniformitetit te perdorimit te ujit 1.3
- Koeficenti orar i jouniformitetit te perdorimit te ujit 2.0
- Koeficenti orar i jo uniformitetit te perdoriit te ujit industrial 4.0

Normat e perdorimit te ujit per qendrat e banuara

Nr	Emertimi	Normativa l/db	Koeficenti orar
1	Qendra te banuara deri 10.000 banore	200	1.7 – 1.65
2	Qendra te banuara 10.000-50.000 banore	250	1.6 – 1.5
3	Qendra te banuara mbi 50.000 banore	300	1.5 – 1.4
4	Per fshatra	100 - 150	2

1.Tabela Llogaritjes se prurjes se nevojshme per fshatin Trash

	Njesia	Llogaritja e prurjes					
		2020	2025	2030	2035	2040	2045
Popullesia Trash	Banore	835	878	922	969	1,019	1,071
Trash		835	878	922	969	1,019	1,071
Norma mesatare per banor	l/b/dite	150.0	150.0	150.0	150.0	150.0	150.0
konsumatoret e pritshem (20-30% e normes) biznese, sociale, shkolla, spitale etj	l/dite	37.5	37.5	37.5	37.5	37.5	37.5
Norma totale	l/b/dite	187.5	187.5	187.5	187.5	187.5	187.5
Prurja mesatare ditore per popullsine	m3/dite	156.6	164.5	172.9	181.8	191.0	200.8
Humbjet, rrjedhje, lidhje te paligjeshme etj.	%	8.0	10.0	12.0	14.0	16.0	20.0
Prurja mesatare ditore per popullsine duke perfshire humbjet rrjedhjet lidhjet e paligjeshme etj.	m3/dite	12.5	16.5	20.8	25.4	30.6	40.2
Kerkesa ditore totale	m3/dite	169.1	181.0	193.7	207.2	221.6	240.9
Norma mesatare per person	l/b/dite	202.50	206.25	210.00	213.75	217.50	225.00
Prurja ne rrjet (me koeficent orar K=2.4) maksimale	l/s	4.70	5.03	5.38	5.76	6.16	6.69
Prurja e kerkuar nga burimi (prurja mesatare)	**l/s**	**1.81**	**1.93**	**2.07**	**2.21**	**2.37**	**2.57**

2.Tabela Llogaritjes se prurjes se nevojshme per fshatin Karthnek

	Njesia	Llogaritja e prurjes					
		2020	2025	2030	2035	2040	2045
Popullesia Karthnek	Banore	360	378	398	418	439	462
Karthnek		360	378	398	418	439	462
Norma mesatare per banor	l/b/dite	150.0	150.0	150.0	150.0	150.0	150.0
konsumatoret e pritshem (20-30% e normes) biznese, sociale, shkolla, spitale etj	l/dite	37.5	37.5	37.5	37.5	37.5	37.5
Norma totale	l/b/dite	187.5	187.5	187.5	187.5	187.5	187.5
Prurja mesatare ditore per popullsine	m3/dite	67.5	70.9	74.6	78.4	82.4	86.6
Humbjet, rrjedhje, lidhje te paligjeshme etj.	%	8.0	10.0	12.0	14.0	16.0	20.0
Prurja mesatare ditore per popullsine duke perfshire humbjet rrjedhjet lidhjet e paligjeshme etj.	m3/dite	5.4	7.1	8.9	11.0	13.2	17.3
Kerkesa ditore totale	m3/dite	72.9	78.0	83.5	89.3	95.5	103.9
Norma mesatare per person	l/b/dite	202.50	206.25	210.00	213.75	217.50	225.00
Prurja ne rrjet (me koeficent orar K=2.4) maksimale	l/s	2.03	2.17	2.32	2.48	2.65	2.89
Prurja e kerkuar nga burimi (prurja mesatare)	**l/s**	**0.78**	**0.83**	**0.89**	**0.95**	**1.02**	**1.11**

3.Tabela Llogaritjes se prurjes se nevojshme per fshatin Sheze

	Njesia	Llogaritja e prurjes					
		2020	2025	2030	2035	2040	2045
Popullesia Sheze	Banore	360	378	398	418	439	462
Sheze		360	378	398	418	439	462
Norma mesatare per banor	l/b/dite	150.0	150.0	150.0	150.0	150.0	150.0
konsumatoret e pritshem (20-30% e normes) biznese, sociale, shkolla, spitale etj	l/dite	37.5	37.5	37.5	37.5	37.5	37.5
Norma totale	l/b/dite	187.5	187.5	187.5	187.5	187.5	187.5
Prurja mesatare ditore per popullsine	m3/dite	67.5	70.9	74.6	78.4	82.4	86.6
Humbjet, rrjedhje, lidhje te paligjeshme etj.	%	8.0	10.0	12.0	14.0	16.0	20.0
Prurja mesatare ditore per popullsine duke perfshire humbjet rrjedhjet lidhjet e paligjeshme etj.	m3/dite	5.4	7.1	8.9	11.0	13.2	17.3
Kerkesa ditore totale	m3/dite	72.9	78.0	83.5	89.3	95.5	103.9
Norma mesatare per person	l/b/dite	202.50	206.25	210.00	213.75	217.50	225.00
Prurja ne rrjet (me koeficent orar K=2.4) maksimale	l/s	2.03	2.17	2.32	2.48	2.65	2.89
Prurja e kerkuar nga burimi (prurja mesatare)	**l/s**	**0.78**	**0.83**	**0.89**	**0.95**	**1.02**	**1.11**

4.Tabela Llogaritjes se prurjes se nevojshme per fshatin Pekishtit

	Njesia	Llogaritja e prurjes					
		2020	2025	2030	2035	2040	2045
Popullesia Pekisht	Banore	1,110	1,167	1,226	1,289	1,354	1,423
Pekisht		1110	1,167	1,226	1,289	1,354	1,423
Norma mesatare per banor	l/b/dite	150.0	150.0	150.0	150.0	150.0	150.0
konsumatoret e pritshem (20-30% e normes) biznese, sociale, shkolla, spitale etj	l/dite	37.5	37.5	37.5	37.5	37.5	37.5
Norma totale	l/b/dite	187.5	187.5	187.5	187.5	187.5	187.5
Prurja mesatare ditore per popullsine	m3/dite	208.1	218.7	229.9	241.6	254.0	266.9
Humbjet, rrjedhje, lidhje te paligjeshme etj.	%	8.0	10.0	12.0	14.0	16.0	20.0
Prurja mesatare ditore per popullsine duke perfshire humbjet rrjedhjet lidhjet e paligjeshme etj.	m3/dite	16.7	21.9	27.6	33.8	40.6	53.4
Kerkesa ditore totale	m3/dite	224.8	240.6	257.5	275.5	294.6	320.3
Norma mesatare per person	l/b/dite	202.50	206.25	210.00	213.75	217.50	225.00
Prurja ne rrjet (me koeficent orar K=2.4) maksimale	l/s	6.24	6.68	7.15	7.65	8.18	8.90
Prurja e kerkuar nga burimi (prurja mesatare)	**l/s**	**2.40**	**2.57**	**2.75**	**2.94**	**3.15**	**3.42**

Tabela permbledhese e llogaritjes se prurjes se pergjithshme per depon e re 250m3 me vendodhje ne fshatin Pekisht.

Nr	Zona	Prurja l/s	Nr.Banoreve	Prurja l/s Prespektiva	Nr.Ban. Prespektiva
1	Pekisht	2.4	1110	3.42	1423

Si rezultat i percaktimit te prurjes se nevojshme per nevojat e ujesjellesit bejme dhe llogaritjen e kapacitetit te depos se re 250m3 ne fshatin Pekisht:
Grafiku i punes se depos

Koha (h)		Dalja (m^3/h)	Hyrja (m^3/h)	Bilanci ne depo m^3
0	0.162			0
1	0.162	2.00	12.32	10.32
2	0.162	2.00	12.32	20.65
3	0.162	2.00	12.32	30.97
4	0.324	3.99	12.32	**39.30**
5	1.062	13.09	12.32	38.53
6	2.4	29.56	12.32	21.28
7	1.718	21.16	12.32	12.44
8	1.718	21.16	12.32	3.59
9	1.618	19.93	12.32	-4.02
10	1.402	17.27	12.32	-8.97
11	0.863	10.63	12.32	-7.28
12	1.062	13.09	12.32	-8.05
13	1.062	13.09	12.32	-8.82
14	1.062	13.09	12.32	-9.58
15	1.348	16.61	12.32	-13.87
16	1.348	16.61	12.32	-18.16
17	1.348	16.61	12.32	-22.44
18	1.618	19.93	12.32	-30.06
19	1.618	19.93	12.32	**-37.67**
20	0.647	7.97	12.32	-33.32
21	0.485	5.97	12.32	-26.98
22	0.324	3.99	12.32	-18.65
23	0.162	2.00	12.32	-8.33
24	0.162	2.00	12.32	2.00
			Volumi i Depos	**76.97**
			Volumi I zjarrit	**108.00**
			Volumi I avarise	**53.38**
			Volumi I Kerkuar	**238.35**
			Volumi i Zgjedhur	**250**

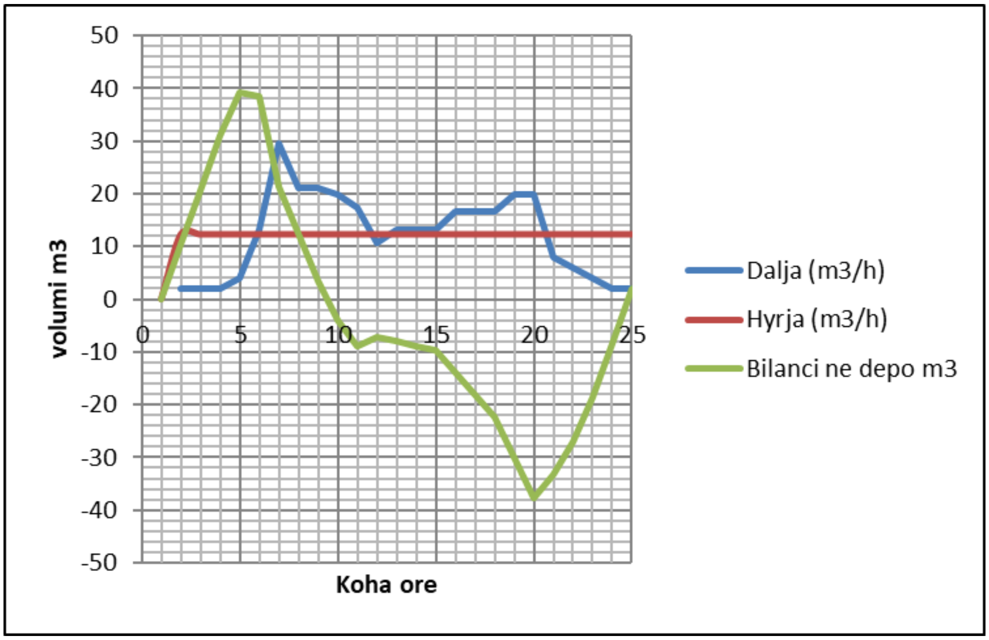


Tabela permbledhese e llogaritjes se prurjes se pergjithshme per depon e re 300m3 me vendodhje ne fshatin Sheze.

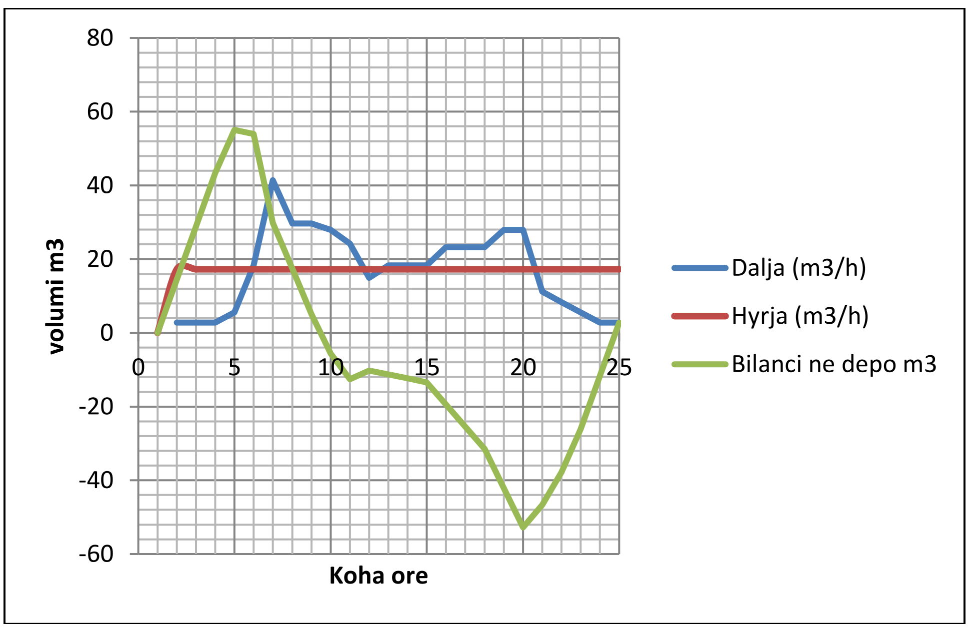
Nr	Zona	Prurja l/s	Nr.Banoreve	Prurja l/s Prespektiva	Nr.Ban. Prespektiva
1	Trash, Karthnek dhe Sheza	3.36	1555	4.79	1994

Si rezultat i percaktimit te prurjes se nevojshme per nevojat e ujesjellesit bejme dhe llogaritjen e kapacitetit te depos se re 300m3 ne fshatin Sheze:

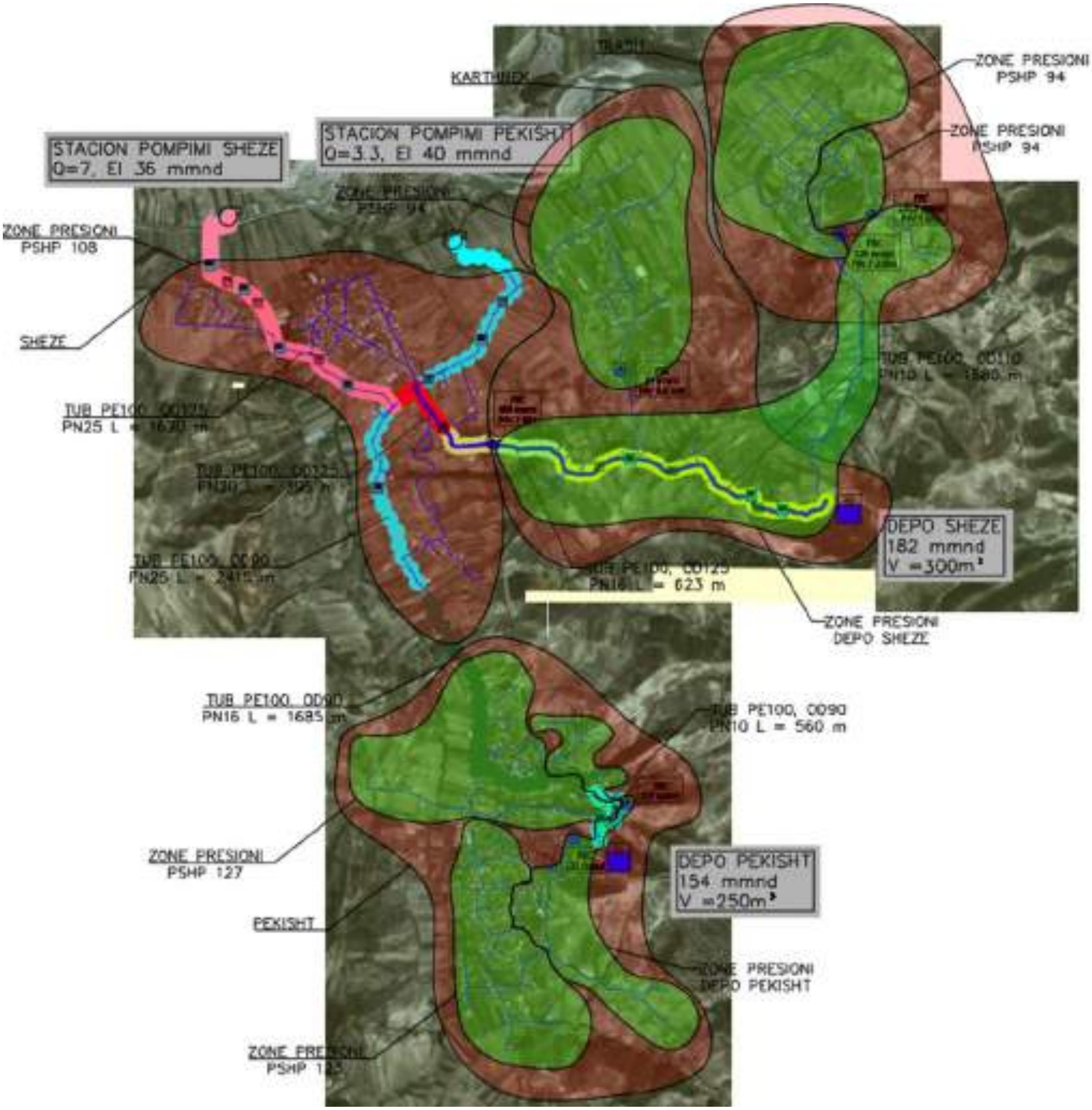
Koha (h)		Dalja (m^3/h)	Hyrja (m^3/h)	Bilanci ne depo m^3
0	0.162			0
1	0.162	2.80	17.26	14.46
2	0.162	2.80	17.26	28.92
3	0.162	2.80	17.26	43.38
4	0.324	5.59	17.26	**55.05**
5	1.062	18.33	17.26	53.98
6	2.4	41.42	17.26	29.82
7	1.718	29.65	17.26	17.43
8	1.718	29.65	17.26	5.03
9	1.618	27.92	17.26	-5.63
10	1.402	24.19	17.26	-12.57
11	0.863	14.89	17.26	-10.20

12	1.062	18.33	17.26	-11.28
13	1.062	18.33	17.26	-12.35
14	1.062	18.33	17.26	-13.43
15	1.348	23.26	17.26	-19.43
16	1.348	23.26	17.26	-25.44
17	1.348	23.26	17.26	-31.44
18	1.618	27.92	17.26	-42.11
19	1.618	27.92	17.26	**-52.77**
20	0.647	11.17	17.26	-46.68
21	0.485	8.37	17.26	-37.79
22	0.324	5.59	17.26	-26.13
23	0.162	2.80	17.26	-11.67
24	0.162	2.80	17.26	2.80
	Volumi i Depos			**107.82**
	Volumi I zjarrit			**108.00**
	Volumi I avarise			**74.78**
	Volumi I Kerkuar			**290.61**
	Volumi i Zgjedhur			**300**

Grafiku i punes se depos



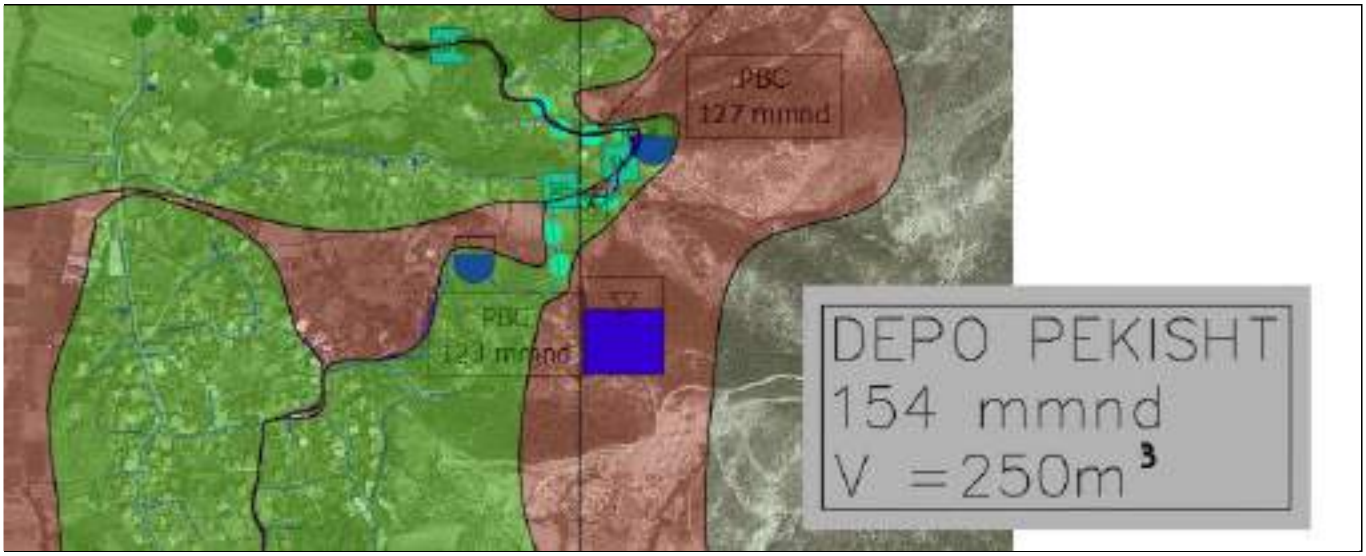
KOREOGRAFIA E PERGJITHSHME E UJESJELLESIT



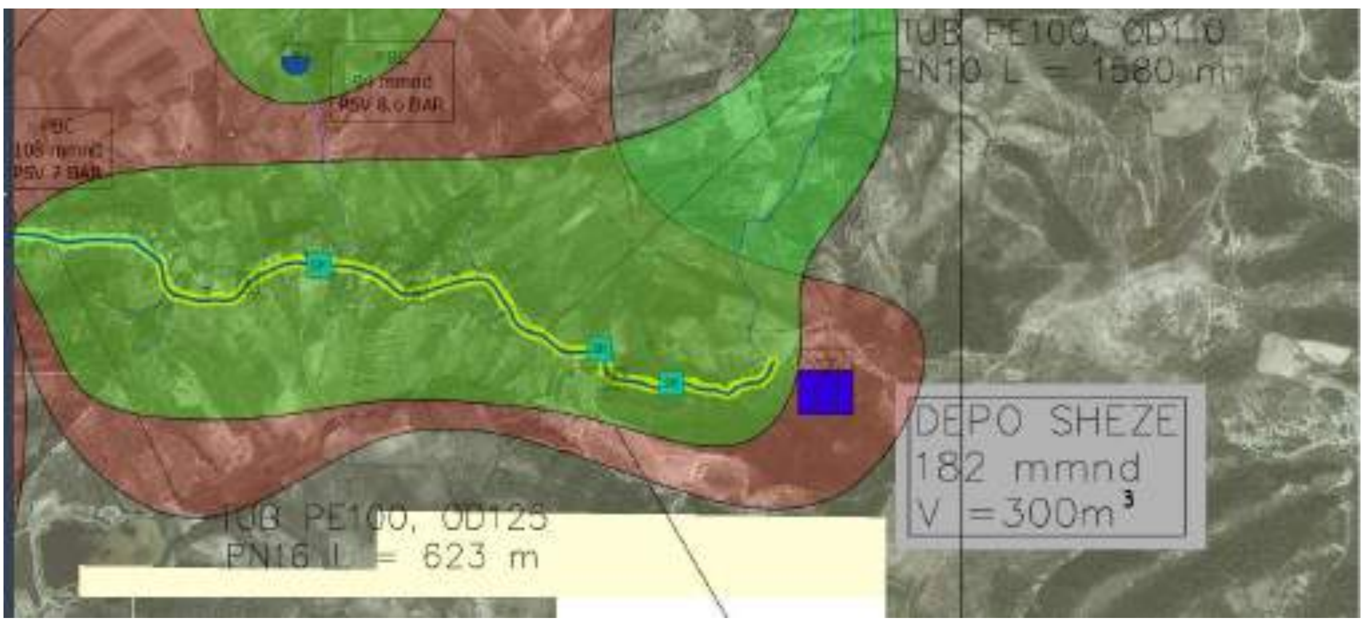
1.Horografia e Pergjithshme

Depot e ujesjellesit.

a. Plan vendosja e depove.



Planvendosja e Depos Pekisht V=250m3, Kuote 154m



Planvendosja e Depos Pekisht V=300m3, Kuote 182m

3. Skema e pergjitheshme e ndertimit te ujesjellesit.

Pas shqyrtimit te hollesishem te disa varianteve te skemes se ndertimit te ujesjellesit, evidentimin dhe studimin e vendeve te mundeshme te vendosjes dhe ndertimit te depos qe ploteson kerkesat e sigurimit te parametrave teknike te projektit te furnizimit me uje te ujesjellesit Nj.A "Sheze" skema me ekonomike dhe me efektive qe ploteson ne kompleks furnizimin me uje ujesjellesit dhe te perspektives se furnizimit me uje te ujesjellesit Nj.A "Sheze" paraqitet si me poshte:

3.1 Burimi i ujit:

Aktualisht si burim kryesor furnizimi me uje per fshatrat e Njesise Administrative Sheze sherbejne dy burine ujore te ndidhura ne bazenin e lumit Shkumbin ne afersi te tij.
Aktualisht per momentin funksionojne te dy puset e ujit.
Pusishpimi Nr. 1 Karthnek. Sipas informacioneve te marara nga stafi i Ujesjelles-kanalizime sh.a Peqin ky burim uji eshte ndertuar qe ne kohen e luftes ne vitin 1939 shume prane lumit shkumbin ne nje kuate 40 m m.n.v.
Duke qene se niveli dinamik i ujerave te nentokes ne kete zone eshte relativisht i ceket, zgjidhja e zhfrytezimit te ketyre ujerave eshte bere nepermjet nje pompe centrifugale horizontale te vendosuar ne stacionin e pompimit, i cili eshte nje strukture beton - arme. Nga shfrytezimi i ketij pushpimi prodhohen 3 l/sek uje i cili furnizon fshatrat Trash dhe Karthnek. Thellesia e tij eshte shume e vogel rreth 4 - 5 m dhe niveli dinamik i tij eshte 2-3 m.
Ndersa ne pusin Nr. 2, i cili ndodhet ne fshatin Sheze, dhe ndodhet ne afersi te lumit Shkumbin ne nje kuote 35 m m.n.v., eshte instaluar nje pompe zhytese, e cila prodhon afersisht 5-6 l/sek dhe furnizon me uje fshatrat Sheze dhe Pekisht.
Pra, fshatrat e Njesise Administrative Sheze aktualisht kane dy sisteme te furnizimit me uje te pamvarur nga njeri-tjetri dhe furnizojne perkatesishtsecili nga dy fshatra. Pusi Karthnek furnizon me uje fshatrat Trash dhe Karthnek dhe pusi Sheze furnizon me uje fshatrat Sheze dhe Pekisht.
Duke qene se ndoshen prane lumit Shkumbin eshte e kuptueshme se sasia e ujit qe prodhojne eshte ne varesi te nivelit te ujit ne kete lume qe varet drejtperdrejte nga reshjet e shiut.

Stacioni i Pompimit Karthneke.

Ky stacion pompimi,furnizon me uje fshatrat Trash dhe Karthneke. Karakteristikat e tij jane si me poshte:

Pompe centrifugale horizontale.

DIAMETRI I BRENDSHEM I PUSIT : D > 400 mm (Eshte si burim me thellesi 4 m)
Q= 3 l/sek OSE 10.8 m^3/ore
H= 180-170 m
MENYRA E LESHIMIT : Direkt
NR.I RROTULLIMEVE:n=3445rrot/min
FUQIA E ELEKTROMOTORIT: Pn=15 kW
TENSIONI I PUNES: 3X380 V NE TREKENDESH
Gjatesia e linjes St.Pompimi Karthneke- depo Trash eshte 2.5 km dhe gjatesia e linjes stacion Pompimi Karthneke -depo Karthnek eshte 1.8 km.
H-thithje=2 m.

Stacioni i Pompimit Sheze.

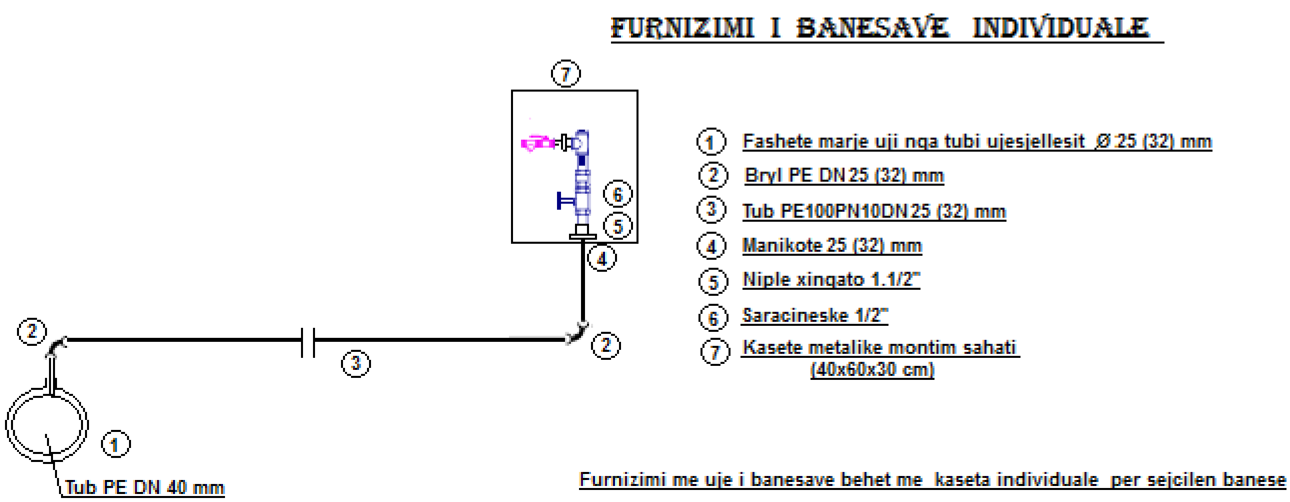
Ky stacion pompimi furnizon me uje fshatrat Sheze dhe Pekisht. Karakteristikat e tij jane si me poshte:

Pompe Zhytese.

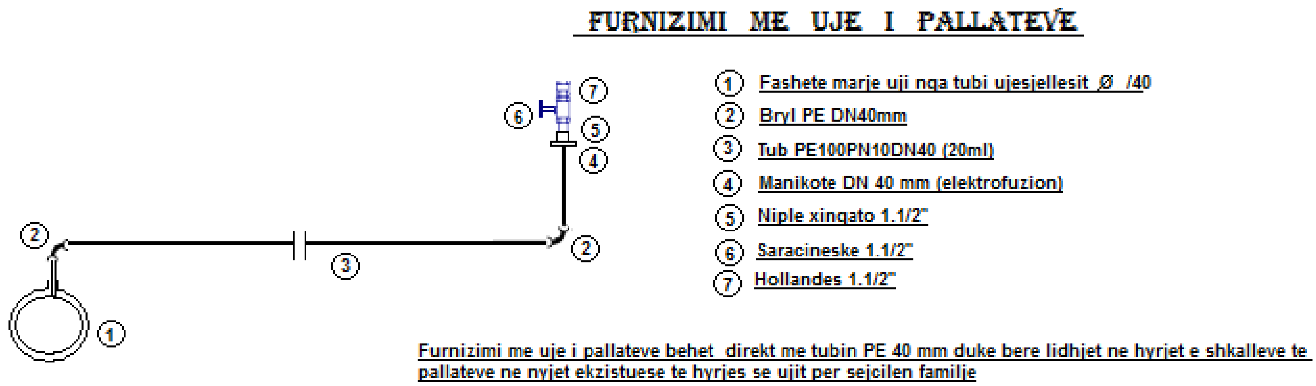
DIAMETRI I BRENDSHEM I PUSIT : D = 120 mm
Q= 6 l/sek OSE 21.6 m³/ore
H=170-165 m
MENYRA E LESHIMIT : Direkt
NR.I RROTULLIMEVE:n=3445rrot/min
FUQIA E ELEKTROMOTORIT:Pn= 18 kW
TENSIONI I PUNES: 3X380 V NE TREKENDESH
Gjatesia e linjes St.Pompimi- depo Sheze 2 km dhe stacion Pompimi depo Pekisht 4 km.
Niveli dinamik ku punon pompa eshte: H-thithje=4.5 m.

4.4 Lidhja me Banesat

Ne ujesjellesin ne Njesine Administrative Sheze furnizimi me uje do te realizohet me lidhje individuale per sejcilen banese me vehte, me lidhje nga tubacionet unazore te ujesjellesit me fasheta dhe me kaseta metalike per secilen banese, vendi i vendosjes se te ciles do te vendoset ne bashkepunim me Njesine Vendore dhe pronarit te baneses gjate zbatimit te punimeve.



Furnizimi me uje ne godinat ekzistues 3-5 kate, te cilet i kane instalimet e brendeshme te furnizimit me uje, do behet duke shpene linjen e furnizimit me uje ne sejcilen hyrje (shkalle) te pallatit dhe duke e lidhur ate me linjen kryesore te furnizimit me uje te brendshem te pallateve.



5. LLOGARITJA E TUBACIONIT TE DERGIMIT

1. Kuota e hyrjes se tubit ne Pusshpimin; 36.19 m

2. Kuota e vendosjes se depos 300m3; 182.93 m m

3. Gjatesia e pergjitheshme e tubit te dergimit: 4242 ml

4. Prurja e ujit Q=7 l/sec

5.Disniveli gjeodezik i pompave:

Kuota e marjes se ujit; 36.19 m

Kuota e dergimit; 182.93 m

Disniveli i zhvillimit te pompes: Hgj=182.93 - 36.19 =146.74 m

Llogaritja e tubacionit te dergimit:

Tubi i dergimit - PE d=110mm, t = 12.3 mm, PN 20

$$d = 1.13\, x \sqrt{\frac{Q}{V}}\ ;$$

V=0.95m/sec; Q=7 l/sec ; d=110 mm

Diametri i tubit te dergimit meret Ø=110 mm;

1. Humbjet gjatesore ne tubacionin e dergimit behen ne baze te formules Hazen Williams.

$$\Delta H = 10.676\ \frac{Q^{1.852}}{C^{1.852}\ D^{4.87}} * \ L\ (m)$$

Ku:

H = humbjet e presionit ne linjen e dergimit;

Q = prurja e ujit, l/sec

L = Gjatesia e tubit te dergimit, m

C = Koeficenti Haezen Williams, 100-120 per tubo celiku;130-150 per tubo plastike.(meret 120)

$\Delta H=10.676* \frac{0.082^{1.852}}{120^{1.852}\ 0.273^{4.87}} * 4242$:   H=81.3 ml.

Hpompes= ΔHgjeodezike+ΔHgjatesore + ΔHlokale = 146+38.26+4.5 = 131.91 m

H dergimit pompes = **131.91 m.**

a. Fuqia e vendosur e pompes;

Fuqia e vendosur e pompes llogaritet sipas formules:

$$N= \frac{1000\ Q\ H}{102 * \eta_p * \eta_{elm}} \quad \text{(ne kw)}$$

Ku:

Q = prupja e pompes, ne m3/sec;

H = presioni i pompes, ne m;

η_p = rendimenti i pompes; (0.75)

η_{elm} = rendimenti i elektromotorit (0.85)

Karakteristikat e pompave

N=18 kw

Q=6 l/sec;

Hd=170 m;

6. Llogaritjet e rrjetit shperndares

Per percaktimin e prurjeve maksimale orare te zonave te banuara zakonisht merret nje koeficent orar nga 1.5 deri ne 2, gjithmone ne funksion te numurit te banoreve.

Ky percaktim eshte i sakte kur zona e banuar eshte relaativisht e madhe. Ne rastin e zonave te banuara realtivisht te vogla. prurjet llogaritese maksimale percaktohen bazuar ne probabilitetin e veprimit te pajisjeve sanitare. Per percaktimin e ketyre prurjeve maksimale kemi pranuar shprehjen e meposhtme si me te thjeshte, qe merre parasysh sasine e ujit te pajisjeve ne pjesen e linjes se ujesjellesit dhe numrin e tyre ne kete pjese.

$$q\max = \sum qi \frac{1}{\sqrt{N-1}}$$

ku:

$\sum qi$ - prurja maksimale e te gjithe paisjeve ne pjesen e linjes se ujesjellesit
N - numuri total i paisjeve sanitare ne pjesen e linjes se ujesjellesit

Pajisjet sanitare te supozuara ne pjeset e rrjetit sipas zonave te banimit, zona e lagjeve te ujesjellesit jepen me poshte:

Pajisjet sanitare

No	**Pajisjet sanitare**	**Prurja, L/s**	**Pajisjet sanitare**	**Prurja, L/s**
1	Lavapjate 1 cope	0.2	Lavapjate 2 cope	0.4
2	Lavaman 1 cope	0.1	Lavaman 2 cope	0.2
3	WC 1 cope	0.1	WC 2 cope	0.2
4	Dush 1 cope	0.2	Dush 2 cope	0.4
Total	**4 pajisje**	**0.6**	**8 Pajisje**	**1.2**

Ne menyre te thjeshtuar prurja maksimale per rastin me 4 pajisje jepet me shprehjen e meposhtme:

$$q\max = 0.6H \frac{\sqrt{N}}{N}$$

ku:

H - numuri i banesave.
N - numuri total i paisjeve sanitare ne pjesen e linjes se ujesjellesit.

Duke futur numrin e paisjeve te barabarte me 4 per cdo banese shprehja e prurjes maksimale jepet si me poshte vetem ne funksion te numurit te banesave:

$$q\max = 0.3H^{0.5}$$

Per rastin me 8 pajisje sanitare ne apartament, shprehja per prurja maksimale do te jete

$$q\max = 0.43H^{0.5}$$

7. STUDIMI GJEOLOGJIK

A. Zona ku ndertohet ujesjellesi Nj.A Sheze

Zona ku shtrihet ujesjellesi ben pjese ne Ultesiren Perendimore te Shqiperise, e cila perfaqeson teracen detare dhe lumore te lumit Shkumbin, e cila perbehet nga Depozitime detare, depozitime lagunore kenetore, depozitime lumore dhe Neogjenike. Depozitimet e kuaternarit kane trashesi 50-60 m dhe depozitimet Neogjenike kane trashesi 100-200 m.

Zona e shtrirjes se linjave te ujesjellesit eshte pergjithesisht e rrafshet dhe me diferenca te vogla kuotash.

Depozitimet e Kuaternarit (Q4dt+kt+al)

Depozitimet detare perfaqesohen nga zhavore koker vogel deri ne zhure, rera, surera, suargjila dhe argjila.

Jane depozitime pak deri ne mesatarisht te konsoliduara qe takohen ne te gjithe zonen lagunore me trashesi 20-30 m.

Depozitimet e Neogjenit (N_2^2 rr)

Depozitimet e Neogjenit qe perbehen nga conglomerate dhe ranore, shume ralle argjilite, jane me ngjyre gri me cimentim te dobet deri mesatar.

Pjesa e siperme e ketyre depozitimeve eshte e perajruar. Keto depozitime dalin ne siperfaqe ne kodrat ne Veri – Lindje te zones, ne vendin e ndertimit te depos se ujesjellesit.

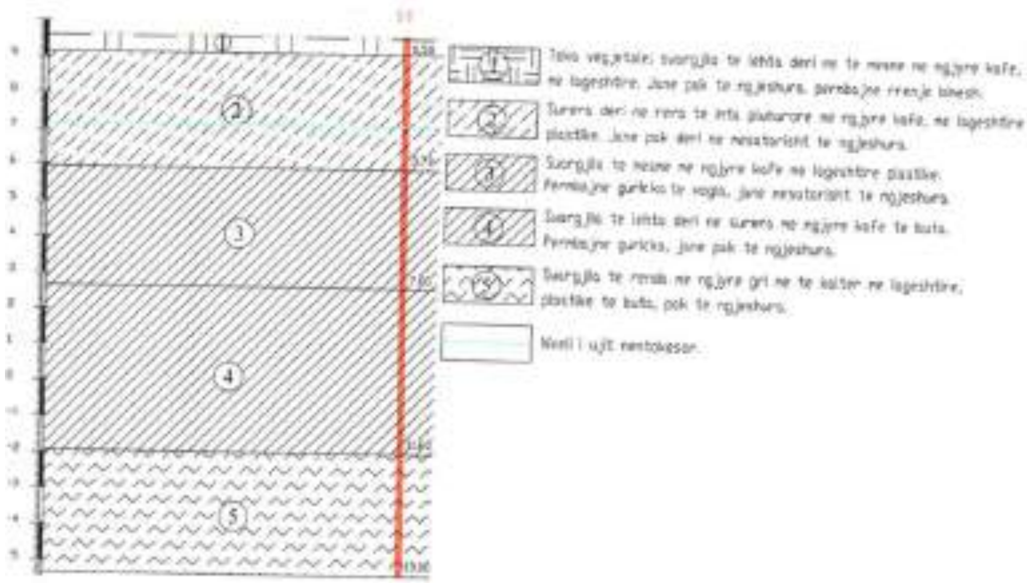
Kushtet Hidrogjeologjike.

Nga studimet e kryera ne zonen e Peqinit (matjet e kryera ne shpimet ne vite me shtrirje ne gjithe zonen), rezulton se niveli i ujit nentokesor ne dimer dhe ne vere eshte i ndryshem.

Niveli i tij eshte ne varesi te rreshjeve te shiut qe bien ne periudha te ndryshme te vitit dhe ne varesi te nivelit te ujit ne lumen Shkumbin.

Ky nivel rezulton ne pjesen me te madhe te zones deri ne kuoten 2.5 m nen siperfaqen e tokes, kurse ne dimer dhe ne pranvere niveli i ujit nentokesor arin dhe deri 0.8 m nen siperfaqen e tokes.

Ujrat jane te embla dhe nuk jane agresive ndaj hekurit dhe betoneve.



Vend ndodhja , relievi dhe fenomenet gjeologjike te depos

Depo e ujesjellesit jane parapare te vendosen perkatesisht ne fshatin Pekisht dhe Sheze.

Kodrat jane te perbera nga formacione te Neogjenit dhe deri ne siparfaqe dalin formacione konlomerate, mbi te cilat ne trashesi jo me te madhe se 1 m jane te vendosura depozitimet deluviale.

Ne gjithe kodren dhe shpatet e saj nuk verehen deformacione apo shkarje.

Sipas perberjes litologjike dhe karakteristikave fiziko-mekanike kemi vecuar shtresat gjeologo inxhinierike te pemoshteme.

Shtresa Nr.1

Perfaqesohet nga toka vegjetariane te shplara nga ujrat siperfaqesore te perbera nga suargjila te lehta me ngjyre bezhe pa lageshire.

Jane pak te ngjeshura dhe arijne deri 0.6 m.

Shtresa Nr.2

Perfaqeson eluvionin e formacioneve rrenjesore qe perbehet nga argjilite dhe alevrolite te perajruara, me teksture dhe strukture kompakte, me ngyre gri, me perzjerje conglomerate dhe gurishtesh.

Jane pa lageshtire, me cimentim mesatar, te perajruara mesatarisht, te forta dhe te ngjeshura dhe shtrihen deri ne thellesine 10 m.

Per kete shtrese jane vecuar keto karakteristika fiziko – mekanike:

Pesha volumore ne gjendje natyrale: Δ=2.26 ton/m3

Kendi i ferkimit te brendshem: φ = 29°

Kohezioni: C= 0.46 kg/cm2

Moduli i kompresionit: E=1160 kg/cm2

Rezistenca ne shtypje nje boshtore: R_{sh} = 21.4 kg/cm2

Ngarkesa e lejuar ne shtypje: 2.6 kg/cm2

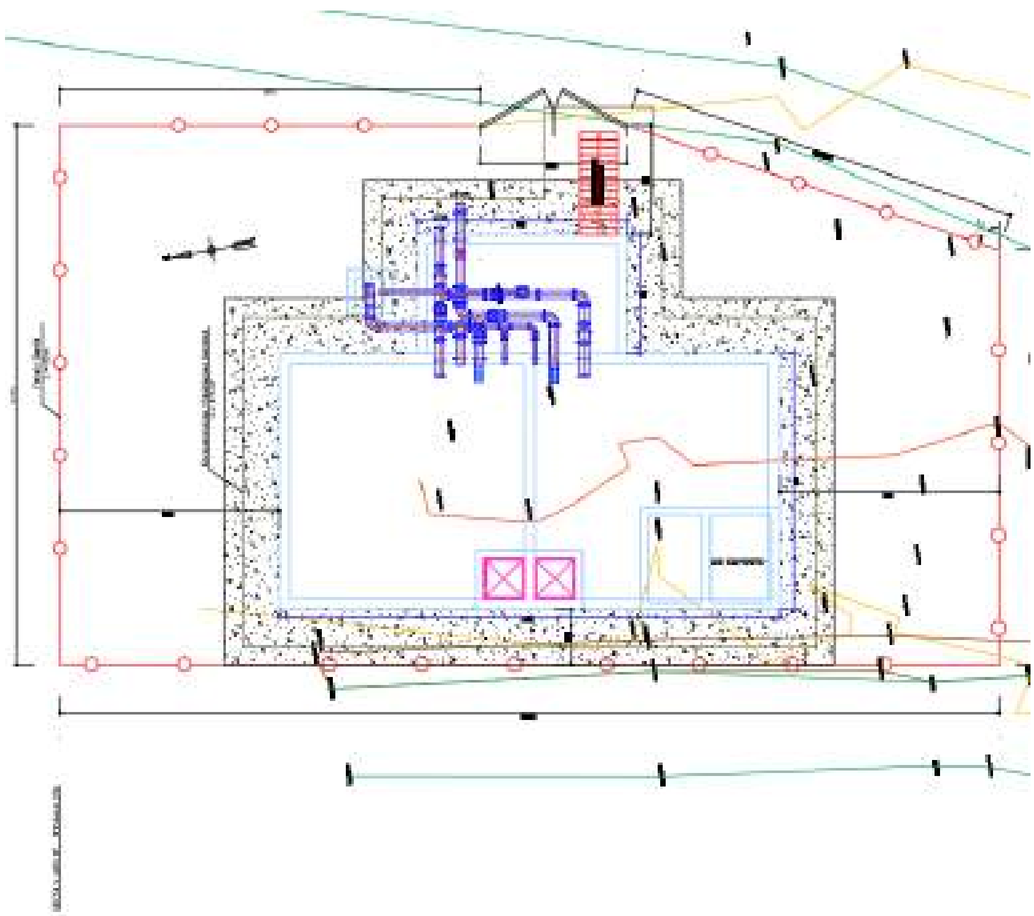
8. Llogaritja konstruktive e depos se ujit 300 m3.

Llogaritja e Depos se ujit 300 m3 eshte bere ne perputhje me rekomandimet e normativave europiane Eurocode 2, 7 dhe 8.

Depoja perbehet nga tre dhoma te cilat komunikojne me njera tjetren nepermjet 2 hapesirave me dimensione 6.4 m x 6.4 m,H=4.15m sic tregohet ne fuguren 1.

Muret e struktures jane me trashesi 30 cm me beton C25/30.

Themeli eshte i tipit pllake me trashesi 50 cm. Soleta eshte tip monolit me trashesi 20 cm me sistem te kryqezuar traresh.



1. **Plani i depos V=300m3**

16.1.Pershkrimi i struktures

16.1.1 Materialet e perdorura

Betoni

Jetegjatesia e vepres - 100 vite

Klasa e ekspozimit: XD2 (Muret, kolonat, pllaka e themelit)

Klasa e ekspozimit: XC2/XC3 (soleta)

Klasa e betonit: C25/30

Hekuri i armimit

Klasa e hekurit: "B" f_{ys}=360MPa

Shtresa mbrojtese

Themeli: 5cm

Muret anesor: 5cm

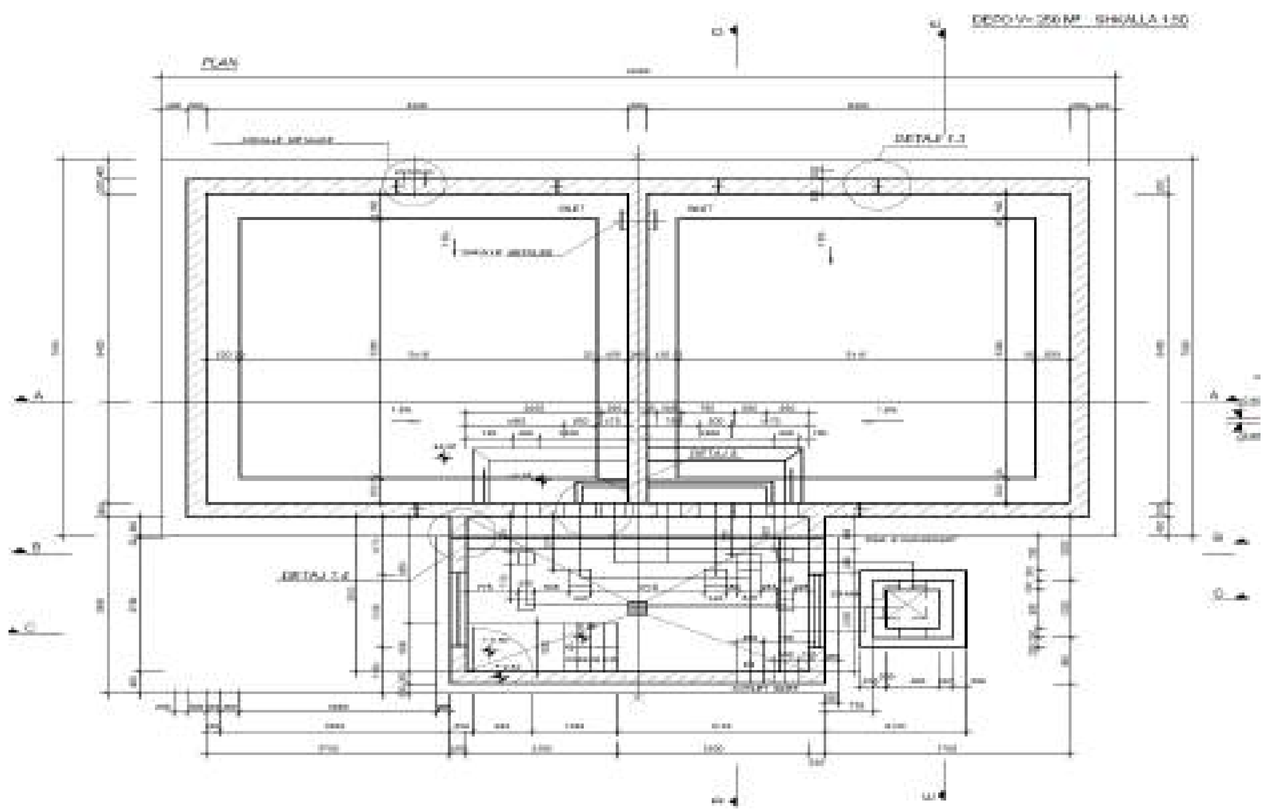
Kolonat: 5cm

Traret: 5cm

Soleta: 2.5cm

16.1.2 Dimensionet

Planimetria e struktures jepet ne fig.2-1. Skema e zgjedhur eshte me e pershtatshmja nga ana teknike dhe ekonomike.



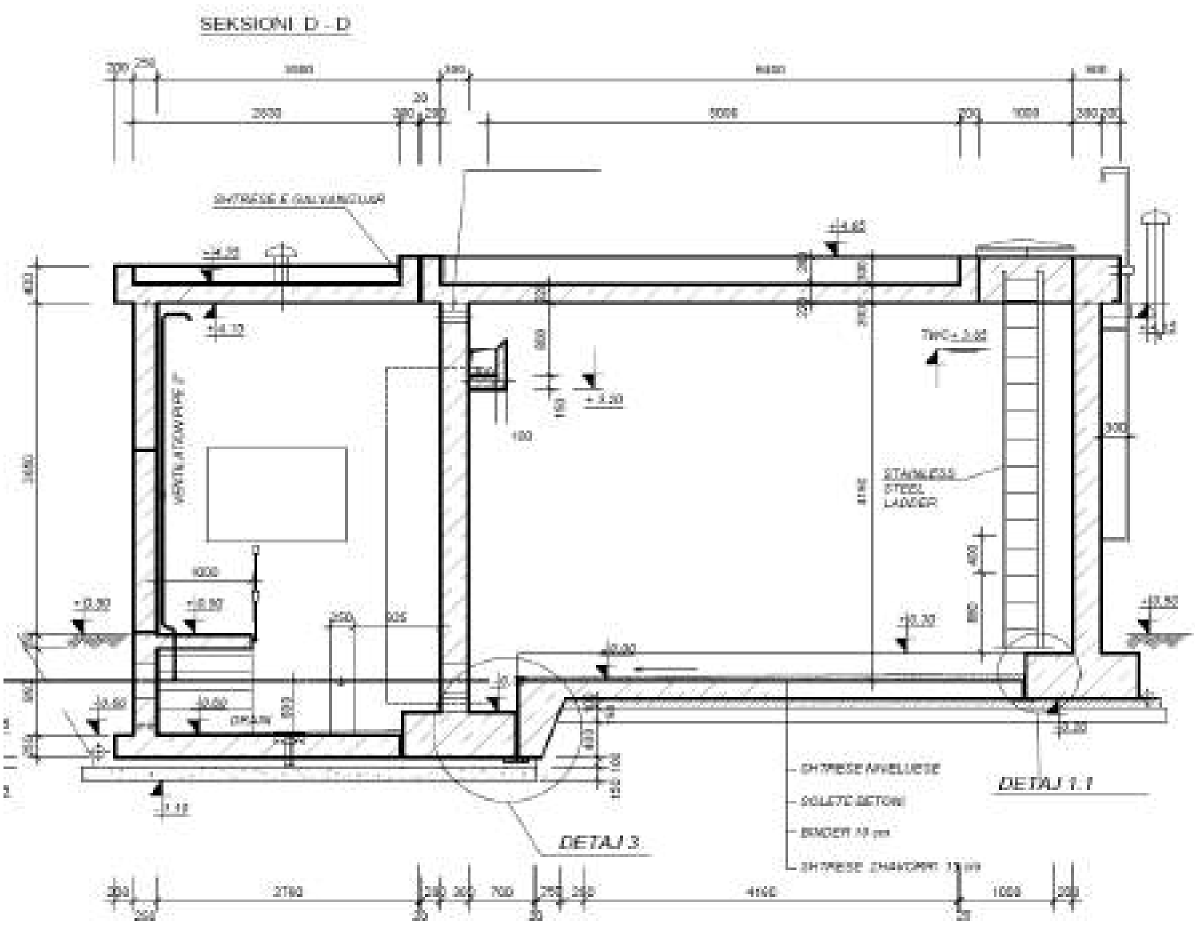
Planimetri e depos me dimensione

Dimensionet jepen ne figuren 2.1. Sejcila dhome e rezervuarit ka dimensione 6.4 m x 6.4 m; muret ndares midis dhomave jane me trashesi 30 cm dhe ka 2 hapesira komunikimi midis dhomave.

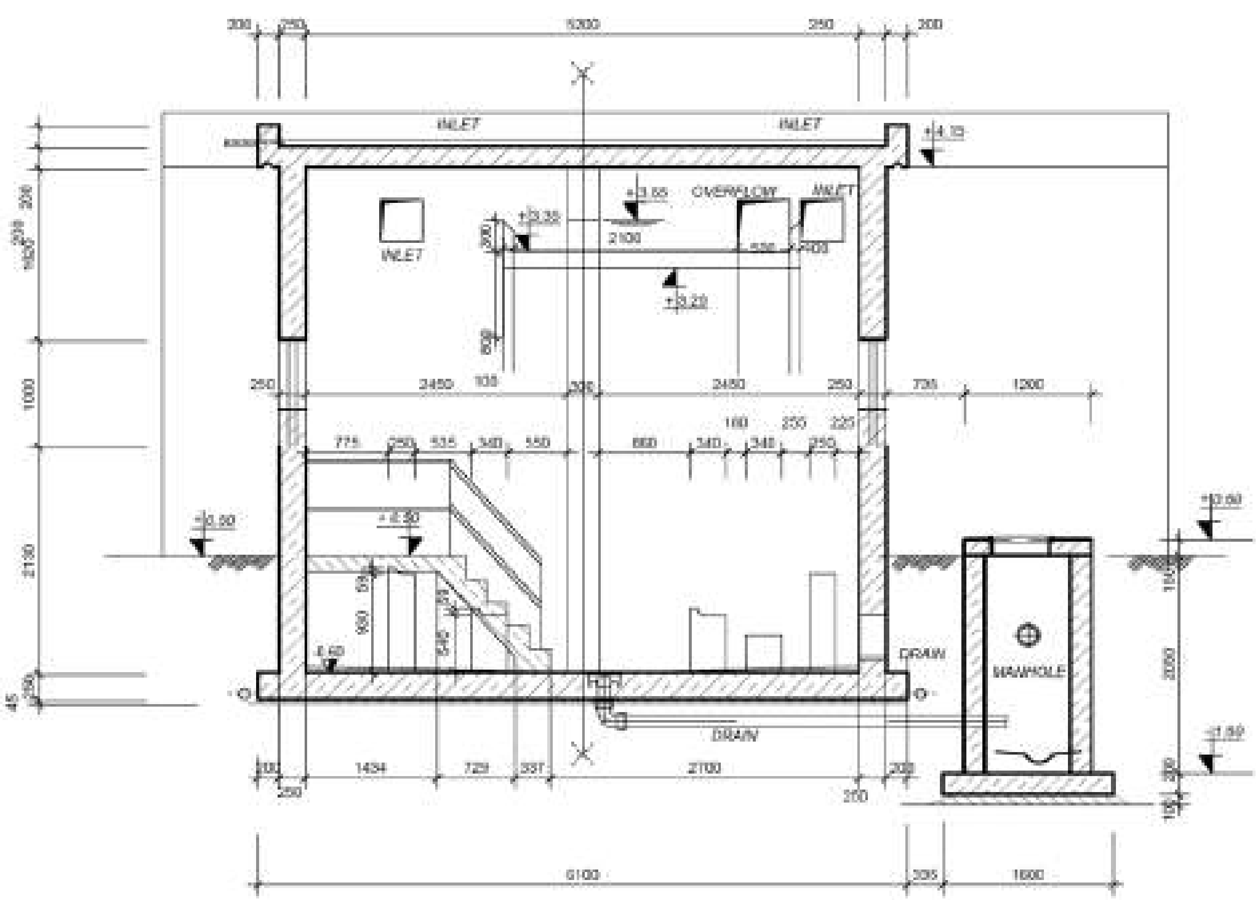
Dimensionet kryesore te rezervuarit jane:

- Dimensioni ne drejtimin gjatesor L = 14.1m (matur jashte faqeve te mureve)
- Dimensioni ne drejtimin terthor B = 7.4m (matur jashte faqeve te mureve)
- Soleta ka trashesi 20cm dhe eshte e armuar me hekur periodik.
- Muret perimetral kane trashesi 20cm.
- Muret ndares kane trashesi 30cm.
- Niveli maksimal i ujit eshte 3.0 m.

Ne figuren 2-2 jepet dhe prerja gjatesore sipas aksit te depos.



SEKSIONI C - C



Prerje terthore e depos

Ne menyre qe te permiresohen vetite fiziko-mekanike te themelit eshte parashikuar nje shtrese, 30 cm zhavor ose callek i fraksionuar dhe nje shtrrese 10 cm beton.

8.1 Metoda e projektimit

Te pergjithshme

Strukturat qe jane te desitinuara per depozitimin e ujit pervec se duhet te permbushin kushtet normale ne qendrushmeri, solidited dhe deformim etj. duhet te pernushin dhe kushtet per mos rrjedhje nepermjet betonit.

Ne projektimin e strukturave te tilla eshte e zakonshme qe nese dimensionimi elementet jane dimensioninuar dhe armuar per kushtet e mos-rrjedhjes atehere dhe soliditedi i elementeve eshte i garantuar. Strukturat uje-mbajtese eshte e rendesihme qe te dimensionohen duke patur parasysh kushte e mos-rrjedhjes se lengut, pasi nese nuk dimensionohen per keto kushte mirembajtja dhe riparimi i tyre eshte shume i kushtueshem. Nje tjeter kriter shume i rendesishem ne projektimin e strukturave uje-mbajtese eshte dhe projektimi i tyre per kushte extreme si psh termetet. Sipas Eurocode 8 keto tipe strukturash duhet te projektohen me faktor te sjelljes q=1.0 ose ne raste te vecanta q=1.5 qe dmth keto struktura duhet te jene funksionale dhe gjate termeteve te fuqishem shkaterues. Ne Eurocode kjo justifikohet me faktin se ujesjellesi furnizon me uje institucione te rendesishme si zjarr-fikeset, spitalet qendrat e emergjencave etj.

Standartet

Rezervuari do te llogaritet ne perputhje me metoden e gjendjeve kufitare.

Kodi ku do te bazohen llogaritjet eshte Eurocode, dhe me konkretisht:

- Eurocode 0, Bazat e projektimit.
- Eurocode 1, Forcat vepruese ne struktura
- EN 1991-1-5, Part 1-5: Forcat termike
- EN 1991-4, Part 4: Sillosat dhe rezervuaret
- Eurocode 2, Projektimi i strukturave betonarme
- EN 1992-1-1, Part 1-1: Rregulla te pergjithshme per ndertesat
- EN 1992-3, Part 3: Strukturat uje-mbajtese
- Eurocode 7, Projektimi gjeoteknik i strukturave betonarme
- EN 1997-1,Part 1: rregulla te pergjithshme.
-

Klasifikimi i forcave

Te perhershme

- Llogaritja e peshes vetiake te struktures

Soleta: 0.20m * 1m * 1m *25.0 kN/m^3 = 5.0 kN / m^2

Shtresat mbi solete:

Llac cimento; 0.06m * 1m * 1m *20.0 kN/m^3 = 1.200 kN / m^2)

Hidroizolim: 0.02m * 1m * 1m *18.0 kN/m^3 = 0.36 kN / m^2)

Muret anesore: 0.5m * 5.5m * 1m * 25.0 kN/m^3 = 68.75 kN (per ml mur)

Themeli: 0.5m * 1m * 1m * 25.0 kN/m^3 = 12.50 kN (per m^2)

Kolona: 0.5m * 0.5 m * 25.0 kN/m^3 = 6.25 kN (per ml kolone)

Pa=mbushja mbi solete: 0.5* 1m * 1m * 18 kN/m^3 = 9 kN (per m^2)

Presioni akstiv ne muret anesor: $p = \gamma * h * k_a$

ka- koeficienti i presionit aktiv (per kushte statike $\psi = 0$)

$$\frac{\left[\cos\left[(\phi - \psi - \beta)\cdot\frac{\pi}{180}\right]\right]^2}{\cos\left(\psi\cdot\frac{\pi}{180}\right)\cdot\cos\left(\beta\cdot\frac{\pi}{180}\right)\cdot\cos\left(\beta\cdot\frac{\pi}{180}\right)\cdot\cos\left[(\delta+\beta+\psi)\cdot\frac{\pi}{180}\right]\cdot\left[1+\sqrt{\frac{\sin\left[(\phi+\delta)\cdot\frac{\pi}{180}\right]\cdot\sin\left[(\phi-\psi-i)\cdot\frac{\pi}{180}\right]}{\cos\left[(\delta+\beta+\psi)\cdot\frac{\pi}{180}\right]\cdot\cos\left[(i-\beta)\cdot\frac{\pi}{180}\right]}}\right]^2}$$

kendi i ferkimit: $\phi = 20°$

inklinimi i murit; $\beta = 0°$

pjerresia e mbushjes: $i = 0°$

kendi i ferkimit mur-terren: $\delta = 13°$

duke aplikuar koeficientet e mesiperm ne formule marrim ka= 0.439.

Vlera e koeficientit te presionit aktiv per kushte sizmike (ag=0.22g) eshte: ka= 0.524.

Variable

Ne rastet kur ka presence uji diagram ndryshon fromen e saj. Pesha volumore e mbushjes llogaritet me formulen:

□$_a$ = □$_{sat}$ - □$_w$

Ku □$_{sat}$ eshte pesha volumore e materialit mbushes dhe □$_w$ eshte pasha volumore e ujit.

Vlera e presionit aktiv ne rastin e prezences se ujit eshte (ne fund te murit anesor):

- ne kushte statike

$$p_b = \gamma * h * k_a + \gamma_w * h = (20-10)\frac{kN}{m^3} * 5.5m * 0.439 + 10\frac{kN}{m^3} * 5.5m = 79.145\ \frac{kN}{m^2}$$

- ne kushte sizmike

$$p_b = \gamma * h * k_a + \gamma_w * h = (20-10)\frac{kN}{m^3} * 5.5m * 0.524 + 10\frac{kN}{m^3} * 5.5m = 83.82\ \frac{kN}{m^2}$$

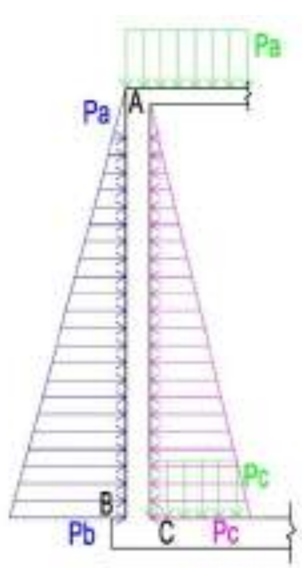


Figure 1

Skema e ngarkesave te aplikuara

Presioni i ujit brenda rezervuarit:

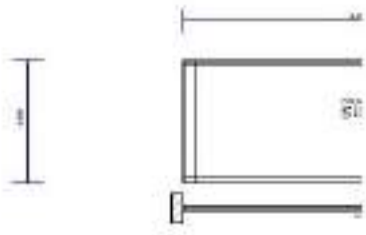
- ne kushte statike:

$$p_c = \gamma_w * h = 10\frac{kN}{m^3} * 3.6m = 36.0\ \frac{kN}{m^2}$$

Llogaritje e soletes

1. SLAB-001

Two-way slab
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)



Concrete-Steel class: C30/37-B500C (EC2 §3)
Environmental class : XC4 (EC2 §4.4.1)
Concrete cover : Cnom=35 mm (EC2 §4.4.1)
Concrete weight : 25.0 kN/m³
γc=1.50, γs=1.15 (EC2 Table 2.1N)
fcd=αcc fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)

1.1. Dimensions and loads

Slab thickness h=0.200 m, Spans lx=6.050 m, ly=4.380 m
Slab loads: dead g=(5.00+2.00)=7.00 kN/m², live q=9.00 kN/m²
Partial safety factors for actions : γG=1.35, γQ=1.50 (EC0 Annex A1)
Combination of variable actions : ψ0=0.70, ψ1=0.50, ψ2=0.30
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=35+12/2=41mm, d=200-41=159mm

Method of analysis: Czerny F., "Tafeln fur vierseitig und dreiseitig gelagerte Rechteckplatten", Beton Kalender 1999, Berlin, Ernst Sohn, 1999
Ly/lx=4.380/6.050=0.72, Table 2.2.6

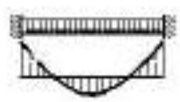
1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Load (STR) qed=γG g+γQ q=1.35g+1.50q=1.35x7.00+1.50x9.00=22.95 kN/m

1.2.1. Direction of slab analysis x-x, lx=6.05 m

Moment at support MedsupA=(1.35x7.00+1.50x9.00)x4.380²/17.50=-25.16 kNm/m
Moment at support MedsupB=(1.35x7.00+1.50x9.00)x4.380²/17.50=-25.16 kNm/m
Moment at span Medspan=(1.35x7.00+1.50x9.00)x4.380²/81.53= 5.40 kNm/m
Reactions dead, VgA= 7.00x4.380/2.09=14.67 VgB= 7.00x4.380/2.09=14.67 kN/m
Reactions live, VqA= 9.00x4.380/2.09=18.86 VqB= 9.00x4.380/2.09=18.86 kN/m

1.2.2. Direction of slab analysis y-y, ly=4.38 m



Moment at support MedsupA=(1.35x7.00+1.50x9.00)x4.380²/13.81=-31.88 kNm/m
Moment at support MedsupB=(1.35x7.00+1.50x9.00)x4.380²/13.81=-31.88 kNm/m
Moment at span Medspan=(1.35x7.00+1.50x9.00)x4.380²/32.42=13.58 kNm/m
Reactions dead, VgA= 7.00x4.380/1.93=15.91 VgB= 7.00x4.380/1.93=15.91 kN/m
Reactions live, VqA= 9.00x4.380/1.93=20.45 VqB= 9.00x4.380/1.93=20.45 kN/m

1.3. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Med= 5.40kNm/m, d=147mm, Kd= 6.33 x/d=0.04 εc2/εs1=-0.9/20.0 ks=2.33, **As= 0.86cm^2/m**
Med= 13.58kNm/m, d=159mm, Kd= 4.31 x/d=0.06 εc2/εs1=-1.3/20.0 ks=2.35, **As= 2.01cm^2/m**
Med=-25.16kNm/m, d=159mm, Kd= 3.17 x/d=0.09 εc2/εs1=-2.0/20.0 ks=2.38, **As= 3.77cm^2/m**
Med=-31.88kNm/m, d=159mm, Kd= 2.82 x/d=0.11 εc2/εs1=-2.4/20.0 ks=2.40, **As= 4.81cm^2/m**

Minimum slab reinforcement, As>=0.26bd·fctm/fyk, (As= 2.40cm^2/m) (EC2 §9.3.1)
minimum principal reinforcement Ø12/40.0 (2.82cm^2/m) , secondary Ø12/45.0 (2.40cm^2/m)

Span reinforcement:	**x-x**	**Ø12/25.0**	(2.82cm^2/m)
	y-y	**Ø12/25.0**	(2.82cm^2/m) , (bottom layer)
Reinforcement over supports:	**Left**	**Ø12/20.0**	(3.77cm^2/m)
	Right	**Ø12/20.0**	(3.77cm^2/m)
	Bottom	**Ø12/20.0**	(4.81cm^2/m)
	Top	**Ø12/20.0**	(4.81cm^2/m)

1.4. Ultimate limit state (ULS), Design for shear (EC2 EN1992-1-1:2004, §6.2, §9.2.2)

Maximum shear forces at distance d from support face maxV=50.33 kN/m
Shear capacity without shear reinforcement Vrdc (EC2 §6.2.2)
Vrdc=[Crdc·k·(100ρl·fck)$^{0.333}$+k1·σcp]·bw·d (EC2 Eq.6.2.a)
Vrdc>=(vmin+k1·σcp)·bw·d (EC2 Eq.6.2.b)
Crdc=0.18/γc=0.18/1.50=0.120, fck=30.00MPa ,bw=1000mm, d=159mm
k=1+ √(200/d) <=2, k=2.00, k1=0.15
ρl=Asl/(bw·d)=481/(1000x159)=0.0030
vmin=0.035·k$^{1.50}$·√fck = 0.54N/mm^2 (EC2 Eq.6.3N)
Vrd,c(min)=0.001x(0.54)x1000x159=85.86kN/m
Vrdc=0.001x[0.120x2.00x(0.30x30.00)$^{0.33}$]x1000x159=79.38, Vrdc=Vrdc(min)=85.86kN/m
Ved=50.33 kN/m <= Vrdc=85.86 kN/m, **Ved<=Vrdc shear reinforcement is not needed**

1.5. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

L=4.380m, b=1.000m, h=0.200m, d=0.159m
Load (quasi-permanent combination) qed=g+ψ2·q=7.00+0.30x9.00=9.70 kN/m
Ly<Lx, Leff=4.380m, Med=(9.70/22.95)x13.58=5.74 kNm/m, Med(SLS)=5.74 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.30e/oo
γc=1.00, γs=1.00 (EC2 §2.4.2.4.2)
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq.7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø12/400
Reinforcement ratio ρ=As1/(b·d)=282/(1000x159)=0.002

1.5.1. State I (uncracked section) (SLS)
Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x0.667)=6094 kNm^2
S=As.zs1=(0.001)^{2}x282x0.059=(0.001)x0.017 m^3 (EC2 Eq.7.21)
Curvature due to moment 1/rM=5.739/6094=(0.001)x0.942 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.017/0.667)=(0.001)x0.164(1/m)
Total curvature 1/r=(0.001)x0.942+(0.001)x0.164=(0.001)x1.106(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(0.667/0.100)=19.33 kNm

1.5.2. State II (fully cracked section) (SLS)
ρ=As/(b·d)=0.002, n=αe=21.88, n·ρ=0.044, ξ=0.681, α=0.255, x=α·d=0.041m
Bending stiffness of fully cracked section, EI=ξ·Es·As·d^2=0.681x200x282x0.159^2=971 kNm^2
S=As.zs1=(0.001)^{2}x282x0.118=(0.001)x0.033 m^3 (EC2 Eq.7.21)
Curvature due to moment 1/rM=5.739/971=(0.001)x5.908 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.033/0.106)=(0.001)x0.329(1/m)
Total curvature 1/r=(0.001)x5.908+(0.001)x0.329=(0.001)x6.236(1/m)
Med=5.74 kNm, σc/σs=0.24/0.78, x=41mm, σs=140 N/mm^2

1.5.3. Checking deflections without calculation (SLS) (EC2 EN1992-1-1:2004, §7.4.2)

l/d=K[11+1.5 √fck ρo/ρ+3.2 √fck(ρo/ρ-1)^3/2]=110.52 (EC2 Eq.7.16a)
fck=30.00N/mm², ρo=0.001x √30.00=0.005, ρ=0.002, ρ'=0.000, ρ<=ρo, K=1.5
l/d=(310/σs)x(l/d), σs=140 N/mm², l/d=(310/140)x110.52=244.89 (EC2 Eq.7.17)
leff/d=4.380/0.159=27.55 <= 244.89, **Span/depth under limits**

1.5.4. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)
Med=5.74<0.70xMcr=0.70x19.33=13.53 kNm, ζ=0.00 (Eq.7.19)
Final curvature (1/r)=0.00x(0.001x6.236)+(1-0.00)x(0.001x1.106)=(0.001)x1.106(1/m) (Eq.7.18)
β=(Ma+Mb)/Mc=(31.88+31.88)/13.58=4.69, k=0.104(1-4.69/10)=0.0552
f=k·Leff²·(1/r)=0.0552x4.380²x1.106=1.2 mm
f=1.17 <= 1000x4.380/250=17.5 mm, **Deflection under limits**

1.5.5. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.200m, d=0.159m, x=0.041m, Ø=12mm
Ned=0.00kN, σc=(Ned/bh)=0.0N/mm², σs=140N/mm²
Act=(h-x)·b=(200-41)x1000=159408 mm²
max(h,b1)=0mm, fctm=2.90N/mm², Ac,eff=159408mm², k=1.00, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x1.00x2.90x159408/140=1322mm²/m

1.5.6. Control of cracking without direct calculation (SLS) (EC2 EN1992-1-1:2004, §7.3.4)

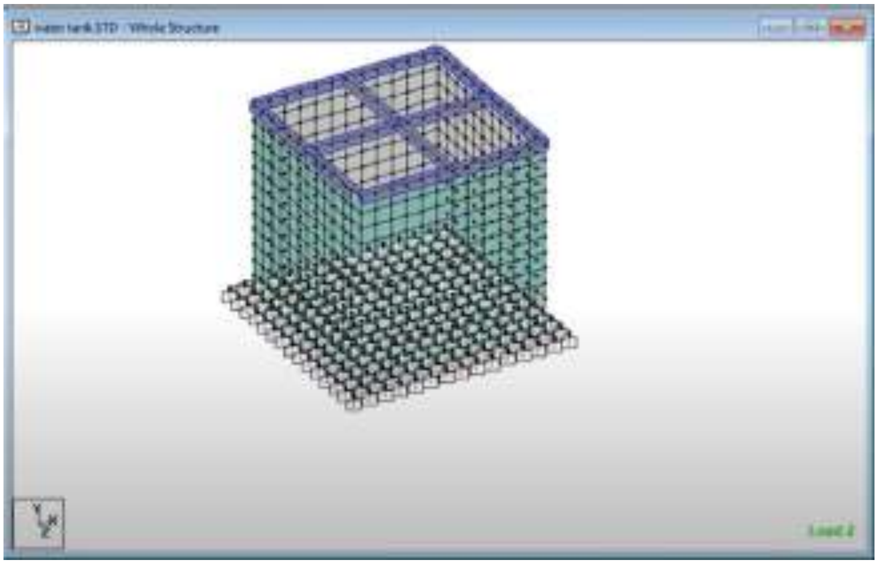
crack width wk=0.3mm(XC4), steel stress σs=140N/mm², Φ*=25mm, max s=250mm (EC2 T.7.2N T.7.3N)
Øs=Ø*(fctm/2.9)[kc·hcr/(2(h-d))]=13mm (EC2 Eq.7.6N)
fctm=2.90N/mm², kc=0.40, hcr=0.5x200=100mm, h=200mm, d=159mm
Maximum bar diameter Ø=13 mm , maximum bar spacing s=250 mm
Bar diameter Ø=12<=13 mm, **Bar diameter under maximum limit**

1.5.7. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=140N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(200-41)x1000=53083 mm² (§7.3.2.3)
ρeff=As/Ac,eff=282/53083=0.005
εsm-εcm=[140-0.4x(2.9/0.005)(1+21.88x0.005)]/200=-0.53 o/oo>=0.6x140/200=0.42 o/oo
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=12mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x35.00+0.8x0.5x0.425x12/0.005=503.00 mm
wk=sr,max·(εsm-εcm)=503.00x0.001x0.42=0.21 mm
wk=0.21 mm <= 0.30 mm =wmax, Environmental class: XC4, **Crack width under limit**

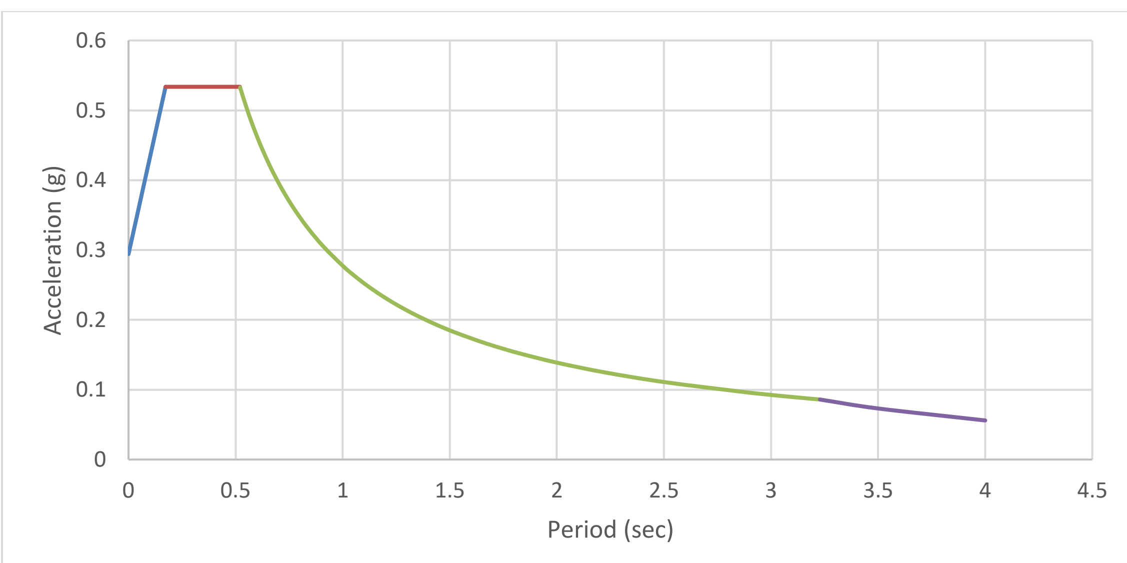
Skema statike e rezervuarit

Rezervuari eshte llogaritur me ndihmen e software-it Sap2000 duke e modeluar sipas metodes se Elementeve te Fundem.



Pamje 3D e rezervuarit

Skema e llogaritjes e plakes se themelit eshte si pllake mbi bazament elastik. Efekti i deformimit te dheut nen themel do te meret parasysh duke vendosur ne modelin llogarites susta. The foundation scheme is: slab of elastic soil. The soil will be modelled with springs that reflect the soil deformation characteristics.



2 spektri reagimit

Te dhena sizmike

Sipas hartes sizmike te Shqiperise zona ku do ndertohet rezervuari eshte zone me intensitet te larte sizmik, dhe i perket shkalles 8 sipas klasifikimit MSK-64. Akseleracioni sizmik eshte mare a_g=0.22. Kategoria e truallit sipas klasifikimit te Eurocode 7 eshte kategoria C. Faktori I sjelljes per projektimin sipas gjendjeve kufitare eshte q=1 per gjendjen kufitare te sherbimit dhe q=1.5 per gjendjen kufitare te shkaterimit.

Kontrolli i plasaritjeve

Per kontrollin e plasaritjeve eshte pranuar qe ato te behen sipas klases 2 qe jep Eurocode. Klasa 2 dhe 3 parashikon qe plasaritjet te mos jene te vazhduara ne gjeresine e seksionit.

Rekomandime per madhesine e plasaritjeve per klasen 2 jepen ne EN1992-3:

Rekomandimi per madhesine e plasaritjeve eshte funksion i koeficientit h_D/ h:

$h_D/ h \leq 5$ wk1 is 0,2 mm
$h_D/ h \geq 35$ wk1 is 0,05 mm.

Rezultatet e llogaritjeve

Ne paragrafin me poshte jepet dhe llogaritja e detajuaj e momenteve ne muret anesor.

Analiza sizmike ne moden impulsive dhe konvektive:

Analiza sizmike ne drejtimin y-y:

a-3 Pesha e themelit te rezervuarit

$$W_f := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} = 2543.625 \quad \text{[kN]}$$

Masa e themelit te rezervuarit

$$m_f := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} \cdot 1000}{9.81} = 259289 \quad \text{[kg]}$$

a-4 Pesha e ujit

$$W_{wat} := L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} = 6326.64 \quad \text{[kN]}$$

Masa e ujit

$$m_{wat} := \frac{L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} \cdot 1000}{9.81} = 644917 \quad \text{[kg]}$$

Analiza ne drejtimin gjatesor

a- Parametrat e modelit suste - mas

$$\frac{m_i}{m_{wat}} = \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 0.274 \qquad m_i := m_{wat} \cdot \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 176719 \quad \text{[kg]}$$

$$h_i := d_w \cdot 0.375 = 1.35 \qquad \text{for } d_w / L_r < 0.75$$

$$h_i := 0.5 - \frac{0.09375}{\frac{d_w}{L_r}} = 0.105 \qquad \text{for } d_w / L_r > 0.75$$

for d_w / L_r <1.33

$$\frac{h_{ijll}}{d_w} = \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 1.7$$

$$h_{iydl} := d_w \cdot \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 6.4 \qquad [m]$$

$$\frac{m_c}{m_{wat}} = 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 0.71$$

$$m_c := m_{wat} \cdot 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 455467 \qquad [kg]$$

$$\frac{h_c}{d_w} = \quad 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 0.52$$

$$h_c := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 1.88 \qquad [m]$$

$$\frac{h_{cydl}}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 2.16$$

$$h_{cydl} := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 7.8 \qquad [m]$$

$$K_c := 0.833 \cdot \frac{m_{vc} \cdot 9.81}{d_w} \cdot \left(\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)\right)^2 = 5.916 \cdot 10^5$$ [N/m]

b- Perioda e lekundjeve

b-1 Perioda ne moden impulsive

$$m_{w.def} := B_r \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot \frac{1000}{9.81} = 70948$$ [kg] [masa e murit te rez. ne drejtimin pingul me sizmen]

$$h_{def} := \frac{\frac{m_i}{2} \cdot h_i + m_{w.def} \cdot \frac{d_w}{2}}{\frac{m_i}{2} + m_{w.def}} = 1.55$$ [m]

$$q_{def} := \frac{\left(\frac{m_i}{2} + m_{w.def}\right) \cdot 9.81}{B_r \cdot d_w \cdot 1000} = 37$$ [kN/m2]

Deformimi i mureve nen veprimin e presionit q_{def} ne lartesine h_{def} eshte:

$d_{def} := 0.0065$ [mm]

Perioda ne moden impulsive $Ti := 2 \cdot \pi \cdot \sqrt{\frac{d_{def}}{9.81}} = 0.162$

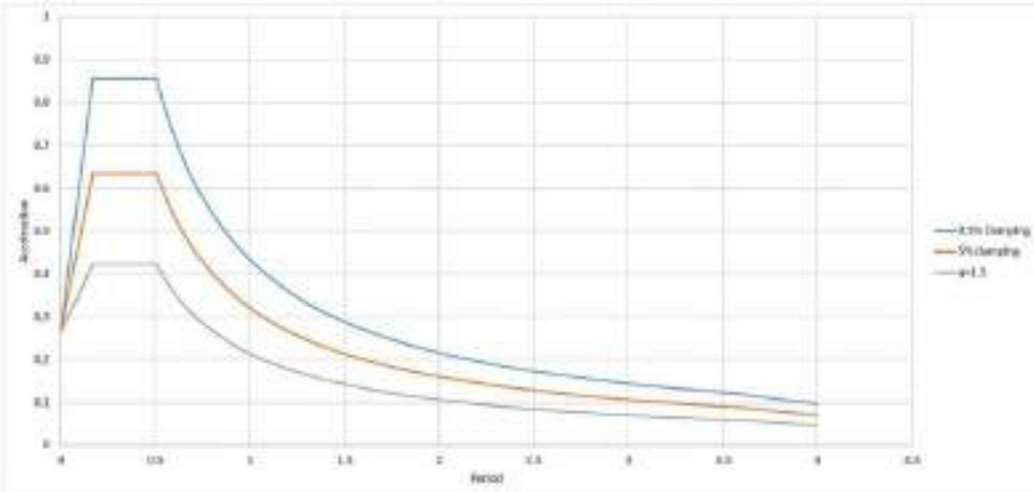
b-2 Perioda ne moden konvektive

$C_c := 4.25$ [coefficient of convective mode time period]

$$T_c := C_c \cdot \sqrt{\frac{L_r}{9.81}} = 5.282$$ [sec]

c -forca prerese ne baze

Sjellja elastike do te modifikohet duke mare parasysh efektin e reduktimit si pasoje e krijimit te kunder-valeve $\eta := \sqrt{\frac{10}{5+0.5}} = 1.348$



$S_{eTimp} := 0.385$ [vlera e projektit per moden impulsive]

$S_{eTcon} := 0.1$ [vlera e projektit per moden konvective]

$Q := \left(\left(m_i + m_w + m_s \right) \cdot S_{eTimp} + m_c \cdot S_{eTcon} \right) \cdot \frac{9.81}{1000} = 2834$ [kN]

d - Momentet perkulese

$h_w := 2.4$ [m] qendra e gravitetit te murit

$h_s := 4.9$ [m] qendra e gravitetit e soletes

d-1 Momenti perkules ne fund te murit ne moden impulsive

$M_{imp} := \left(m_i \cdot h_i + m_w \cdot h_w + m_s \cdot h_s \right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 6008$ [kNm]

d-2 Momenti perkules ne fund te murit ne moden konvektive

$M_{con} := m_c \cdot h_c \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 840$ [kNm]

$M_{total} := \sqrt{M_{imp}^2 + M_{con}^2} = 6067$ [kNm] $\qquad M_{total.1m} := \frac{M_{total}}{B_r} = 523$ [kNm]

e- Momentet

e1- Momentet perkulese ne fund te murit ne moden impulsive

$$M_{imp.over} := (m_i \cdot (h_{cyli} + d_f) + m_w \cdot (h_w + d_f) + m_s \cdot (h_s + d_f)) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 10602 \text{ [kNm]}$$

e2- Momentet perkulese ne fund te murit ne moden konvektive

$$M_{con.over} := m_c \cdot (h_{cyli} + d_f) \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 3691 \text{ [kNm]}$$

$$M_{total.over} := \sqrt{M_{imp.over}^2 + M_{con.over}^2} = 11226 \text{ [kNm]}$$

f- Presioni hidrodinamik

f1- Presioni hidrodinamik ne moden impulsive

ne murin anesor

$$y_1 := 0 \qquad Q_{iw} := 0.866 \cdot \left(1 - \left(\frac{y_1}{d_w}\right)^2\right) \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right) = 0.865$$

$$p_{iw1} := Q_{iw} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 11.986 \text{ [kN/m2]}$$

ne baze te themelit

$$x_1 := \frac{L_r}{2} \qquad Q_{ib} := \frac{\sinh\left(1.732 \cdot \frac{x_1}{L_r}\right)}{\cosh\left(0.866 \cdot \frac{L_r}{d_w}\right)} = 0.051$$

$$p_{iw2} := Q_{ib} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 0.708 \text{ [kN/m2]}$$

f2- Presioni hidrodinamik ne moden konvektive

ne muret anesor

$$y_{c1} := 0 \qquad Q_{cw1} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c1}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.321$$

$p_{cw1} := Q_{cw1} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.87$ [kN/m2]

ne baze te themelit

$$y_{c2} := d_w \qquad Q_{cw2} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c2}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.417$$

$p_{cw2} := Q_{cw2} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 6.31$ [kN/m2]

f3- Presioni hidrodinamik ne moden konvektive ne baze (y=0)

$$y_{cb} := 0 \qquad x_2 := \frac{L_r}{2} \qquad Q_{cb} := 1.25 \cdot \left(\frac{x_2}{L_r} - \frac{4}{3} \cdot \left(\frac{x_2}{L_r}\right)^3\right) \cdot \operatorname{sech}\left(3.162 \cdot \frac{d_w}{L_r}\right) = 0.322$$

$p_{cb} := Q_{cb} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.871$ [kN/m2]

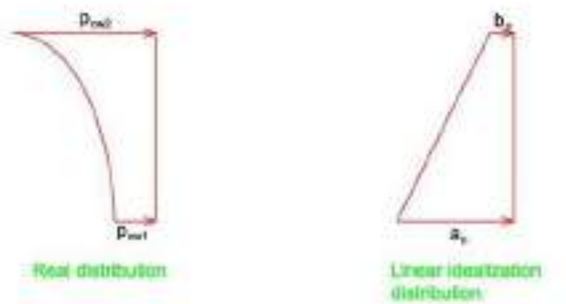
g- Presioni nga inercia e mureve anesor

$p_{ww} := S_{eTimp} \cdot d_r \cdot \gamma_{conc} = 4.813$ [kN/m2]

h- Presioni nga sizma vertikave

$$S_{eTv} := 0.25 \qquad y_v := 0 \qquad p_v := S_{eTv} \cdot \left(\gamma_{wat} \cdot d_w \cdot \left(1 - \frac{y_v}{d_w}\right)\right) = 9$$ [kN/m2]

$$b_c := \frac{q_c}{d_w^{\ 2}} \cdot (6 \cdot h_i - 2 \cdot d_w) = 1.337$$ [kN/m2]



lartesia e vales gjate sizmes

$$R_{fix} := 2$$

$$d_{wave.max} := S_{eTcm} \cdot R_{fix} \cdot \frac{L_r}{2} = 1.515$$

16.1.1. **naliza sizmike ne drejtimin x- x**

Te dhena

$L_r := 11.60$	[m]	dimensioni i depos ne drejtimin gjatesor
$B_r := 15.15$	[m]	dimensioni i dhomes se depos ne drejtimin terthor
$h_r := 4.8$	[m]	lartesia e rezervuarit
$d_r := 0.5$	[m]	trashesia e murit
$d_s := 0.20$	[m]	trashesia e soletes
$d_f := 0.5$	[m]	trashesia e themelit
$d_w := 3.6$	[m]	niveli ujit
$\gamma_{conc} := 25$	[kN/m3]	pesha volumore e betonit
$\gamma_{wat} := 10$	[kN/m3]	pesha volumore e ujit

a- Llogaritja e peshave

a-1 Pesha e mureve te rezervuarit

$$W_w := 2 \cdot (L_r + 2 \cdot d_r + B_r + 2 \cdot d_r) \cdot d_r \cdot h_r \cdot \gamma_{conc} = 3450 \quad \text{[kN]}$$

Masa e mureve te rezervuarit

$$m_w := \frac{2 \cdot (L_r + 2 \cdot d_r + B_r + 2 \cdot d_r) \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot 1000}{9.81} = 351682 \quad \text{[kg]}$$

a-2 Pesha e soletes se rezervuarit

$$W_s := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_s \cdot \gamma_{conc} = 1017.45 \quad \text{[kN]}$$

Masa e soletes se rezervuarit

$$m_s := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_s \cdot \gamma_{conc} \cdot 1000}{9.81} = 103716 \quad \text{[kg]}$$

a-3 Pesha e themelit te rezervuarit

$$W_f := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} = 2543.625 \quad [kN]$$

Masa e themelit te rezervuarit

$$m_f := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} \cdot 1000}{9.81} = 259289 \quad [kg]$$

a-4 Pesha e ujit

$$W_{wat} := L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} = 6326.64 \quad [kN]$$

Masa e ujit

$$m_{wat} := \frac{L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} \cdot 1000}{9.81} = 644917 \quad [kg]$$

Analiza ne drejtimin gjatesor

a- Parametrat e modelit suste - mas

$$\frac{m_i}{m_{wat}} = \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 0.356 \qquad m_i := m_{wat} \cdot \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 229381 \quad [kg]$$

$$h_i := d_w \cdot 0.375 = 1.35 \qquad \text{for } d_w / L_r < 0.75$$

$$h_{i1} := 0.5 - \frac{0.09375}{\frac{d_w}{L_r}} = 0.198 \qquad \text{for } d_w / L_r > 0.75$$

for $d_w / L_r < 1.33$

$$\frac{h_{ig11}}{d_w} = \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 1.28$$

$$h_{iyli} := d_w \cdot \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 4.9 \quad [m]$$

$$\frac{m_c}{m_{wat}} = 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 0.64$$

$$m_c := m_{wat} \cdot 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 413303 \quad [kg]$$

$$\frac{h_c}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 0.54$$

$$h_c := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 1.93 \quad [m]$$

$$\frac{h_{cyli}}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 1.44$$

$$h_{cyli} := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 5.2 \quad [m]$$

$$K_c := 0.833 \cdot \frac{m_{wat} \cdot 9.81}{d_w} \cdot \left(\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)\right)^2 = 8.309 \cdot 10^5$$ [N/m]

b- Perioda e lekundjeve

b-1 Perioda ne moden impulsive

$$m_{w.def} := B_r \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot \frac{1000}{9.81} = 92661$$ [kg] [masa e murit te rez. ne drejtimin pingul me sizmen]

$$h_{def} := \frac{\frac{m_i}{2} \cdot h_i + m_{w.def} \cdot \frac{d_w}{2}}{\frac{m_i}{2} + m_{w.def}} = 1.551$$ [m]

$$q_{def} := \frac{\left(\frac{m_i}{2} + m_{w.def}\right) \cdot 9.81}{B_r \cdot d_w \cdot 1000} = 37$$ [kN/m2]

Deformimi i mureve nen veprimin e presionit q_{def} ne lartesine h_{def} eshte:

$d_{def} := 0.0068$ [mm]

Perioda ne moden impulsive $Ti := 2 \cdot \pi \cdot \sqrt{\frac{d_{def}}{9.81}} = 0.165$

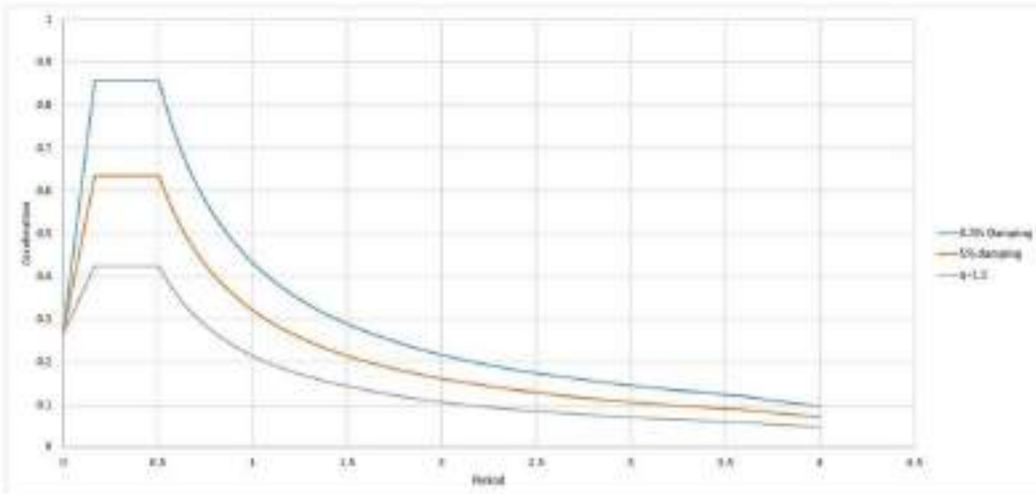
b-2 Perioda ne moden konvektive

$C_c := 4.25$ [coefficient of convective mode time period]

$$T_c := C_c \cdot \sqrt{\frac{L_r}{9.81}} = 4.622$$ [sec]

c -forca prerese ne baze

Sjellja elastike do te modifikohet duke mare parasysh efektin e reduktimit si pasoje e krijimit te kunder-valeve $\eta := \sqrt{\frac{10}{5+0.5}} = 1.348$



$S_{eTimp} := 0.380$ [vlera e projektit per moden impulsive]

$S_{eTcon} := 0.1$ [vlera e projektit per moden konvective]

$Q := \left(\left(m_i + m_w + m_s \right) \cdot S_{eTimp} + m_c \cdot S_{eTcon} \right) \cdot \frac{9.81}{1000} = 2958$ [kN]

d - Momentet perkulese

$h_w := 2.4$ [m] qendra e gravitetit te murit

$h_s := 4.9$ [m] qendra e gravitetit e soletes

d-1 Momenti perkules ne fund te murit ne moden impulsive

$M_{imp} := \left(m_i \cdot h_i + m_w \cdot h_w + m_s \cdot h_s \right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 6195$ [kNm]

d-2 Momenti perkules ne fund te murit ne moden konvektive

$M_{con} := m_c \cdot h_c \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 783$ [kNm]

$M_{total} := \sqrt{M_{imp}^{2} + M_{con}^{2}} = 6245$ [kNm] $\quad M_{total.1m} := \frac{M_{total}}{B_r} = 412$ [kNm]

e- Momentet

e1- Momentet perkulese ne fund te murit ne moden impulsive

$$M_{imp.over} := \left(m_i \cdot \left(h_{igll} + d_f\right) + m_w \cdot \left(h_w + d_f\right) + m_s \cdot \left(h_s + d_f\right)\right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 10538 \text{ [kNm]}$$

e2- Momentet perkulese ne fund te murit ne moden konvektive

$$M_{con.over} := m_c \cdot \left(h_{cyll} + d_f\right) \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 2298 \text{ [kNm]}$$

$$M_{total.over} := \sqrt{M_{imp.over}^{2} + M_{con.over}^{2}} = 10785 \text{ [kNm]}$$

f- Presioni hidrodinamik

f1- Presioni hidrodinamik ne moden impulsive

ne murin anesor

$$y_1 := 0 \qquad Q_{iw} := 0.866 \cdot \left(1 - \left(\frac{y_1}{d_w}\right)^2\right) \cdot \tanh\left(0.866 \cdot \frac{L_y}{d_w}\right) = 0.859$$

$$p_{iw1} := Q_{iw} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 11.758 \text{ [kN/m2]}$$

ne baze te themelit

$$x_1 := \frac{L_r}{2} \qquad Q_{ib} := \frac{\sinh\left(1.732 \cdot \frac{x_1}{L_r}\right)}{\cosh\left(0.866 \cdot \frac{L_r}{d_w}\right)} = 0.12$$

$$p_{iw2} := Q_{ib} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 1.637 \text{ [kN/m2]}$$

f2- Presioni hidrodinamik ne moden konvektive

ne muret anesor

$$y_{c1} := 0 \qquad Q_{cw1} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c1}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.274$$

$p_{cw1} := Q_{cw1} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 3.176$ [kN/m2]

ne baze te themelit

$$y_{c2} := d_w \qquad Q_{cw2} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c2}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.417$$

$p_{cw2} := Q_{cw2} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.831$ [kN/m2]

f3- Presioni hidrodinamik ne moden konvektive ne baze (y=0)

$$y_{cb} := 0 \qquad x_2 := \frac{L_r}{2} \qquad Q_{cb} := 1.25 \cdot \left(\frac{x_2}{L_r} - \frac{4}{3} \cdot \left(\frac{x_2}{L_r}\right)^3\right) \cdot \mathrm{sech}\left(3.162 \cdot \frac{d_w}{L_r}\right) = 0.274$$

$p_{cb} := Q_{cb} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 3.177$ [kN/m2]

g- Presioni nga inercia e mureve anesor

$p_{ww} := S_{eTimp} \cdot d_r \cdot \gamma_{conc} = 4.75$ [kN/m2]

h- Presioni nga sizma vertikave

$$S_{eTv} := 0.25 \qquad y_v := 0 \qquad p_v := S_{eTv} \cdot \left(\gamma_{wat} \cdot d_w \cdot \left(1 - \frac{y_v}{d_w}\right)\right) = 9$$ [kN/m2]

k- Presioni hidrodinamik makimal

$$p := \sqrt{(p_{swi} + p_{wsi})^2 + p_{eo1}^2 + p_{v}^2} = 19.068 \qquad \text{[kN/m2]}$$

m- Presioni linear ekuivalent

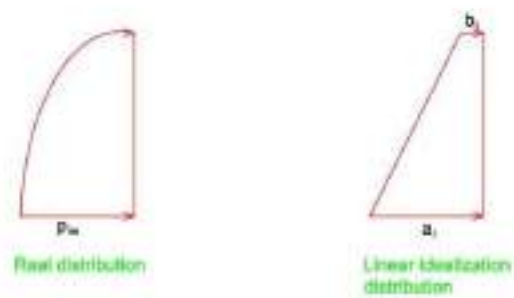
forca prerese per 1 ml ne baze per masen ne moden impulsive eshte

$$q_i := \frac{S_{eTimp} \cdot m_i \cdot 9.81}{2 \cdot B_r \cdot 1000} = 28 \qquad \text{[kN/m2]}$$

vlera e presionit ekuivalent liear siper dhe poshte eshte

$$a_i := \frac{q_i}{d_w^2} \cdot (4 \cdot d_w - 6 \cdot h_i) = 13.718 \qquad \text{[kN/m2]}$$

$$b_i := \frac{q_i}{d_w^2} \cdot (6 \cdot h_i - 2 \cdot d_w) = 1.96 \qquad \text{[kN/m2]}$$



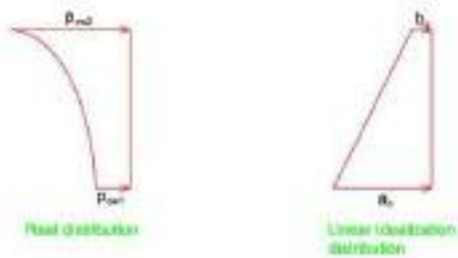
forca prerese per 1 ml ne baze per masen ne moden konvektive

$$q_c = \frac{S_{eTcon} \cdot m_c \cdot 9.81}{2 \cdot B_r \cdot 1000} = 13 \qquad \text{[kN/m2]}$$

vlera e presionit ekuivalent liear siper dhe poshte eshte

$$a_c = \frac{q_c}{d_w^2} \cdot (4 \cdot d_w - 6 \cdot h_c) = 6.505 \qquad \text{[kN/m2]}$$

$$b_c := \frac{q_c}{d_w^{\,2}} \cdot (6 \cdot h_i - 2 \cdot d_w) = 0.929$$ [kN/m2]



lartesia e vales gjate sizmes

$$R_{fix} := 2$$

$$d_{wave\_max} := S_{eTcon} \cdot R_{fix} \cdot \frac{L_r}{2} = 1.16$$

Rezultatet e analizes statike

Ne menyre qe te kapet bashkeveprimi truall-strukture, vepra eshte analizuar ne software-in Sap2000.

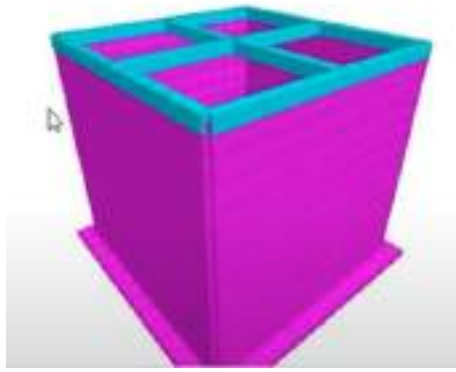


Figure Error! No text of specified style in document.**-3 Pamje 3D e modelit te rezervuarit**

Momente perkulese nga veprimi i presionit te mbushjes anesore (Njesite kN*m)

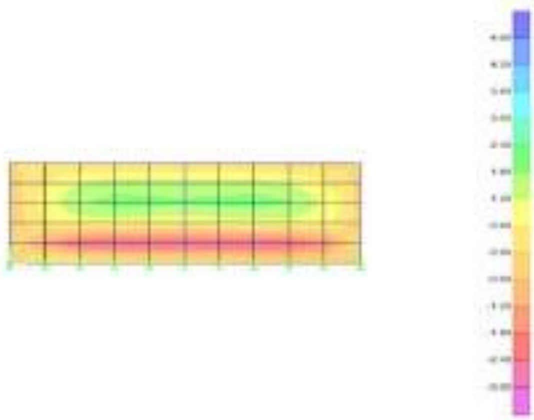


Figure Error! No text of specified style in document.**-4 Momentet perkulese M1-1, ne aksin 1-1 (te modelit)**

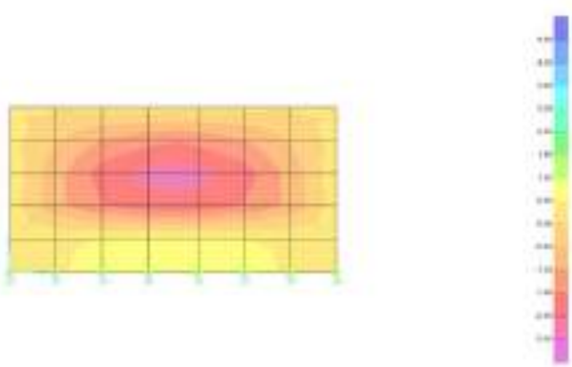


Figure -5 Momentet perkulese M1-1, ne aksin A-A (te modelit)

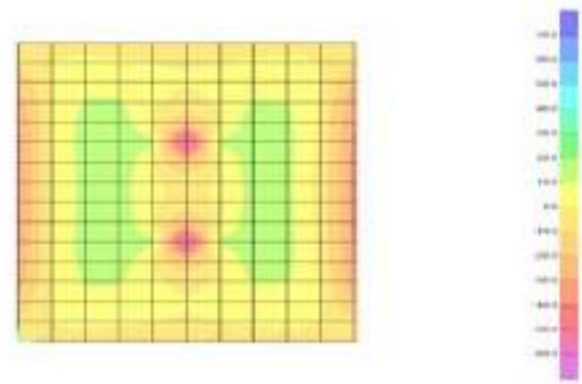


Figure -6 Momentet perkulese M1-1 ne solete

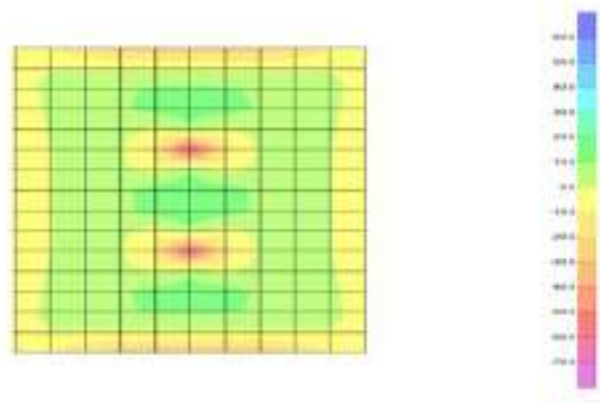


Figure 7 Momentet perkulese M2-2

Momentet pekulese ne pllaken e themelit (njesite kN*m)

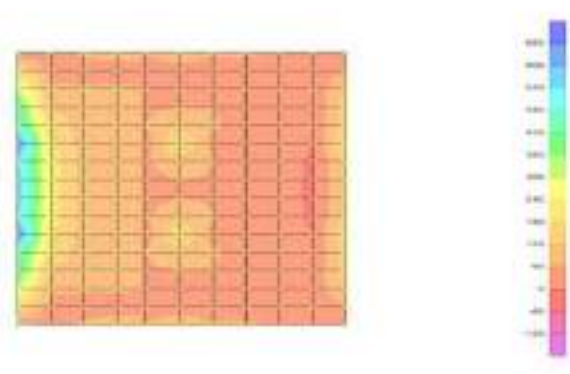


Figure -8 Momentet pekulese M 1-1 sizma xx

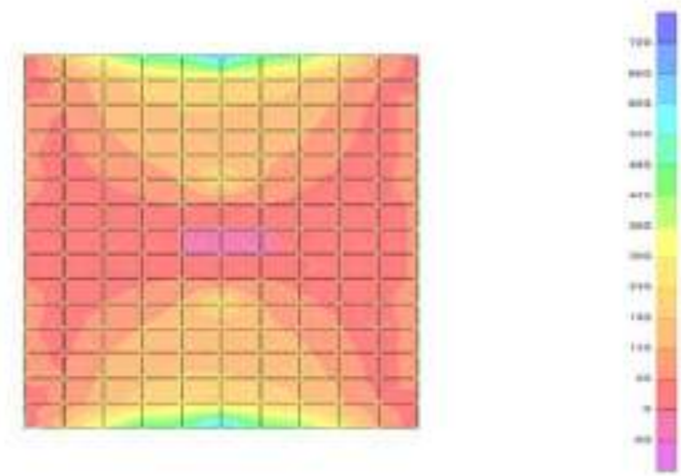


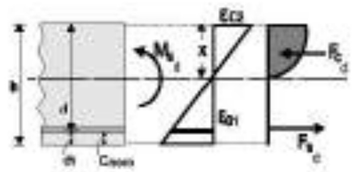
Figure -9 Momentet pekulese M 2-2 sizma y-y

Dimensionimi i seksionit te mureve

16.1.2. **Dimenionimi i seksionit te murit anesor per drejtimin gjatesor**

1. SLAB-002

Cross section of solid slab in bending
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)



h=0.500 m, Med=523.00 kNm
concrete-steel class: C30/37-B500C (EC2 §3)
Environmental class : XC1 (EC2 §4.4.1)
concrete cover : Cnom=40 mm (EC2 §4.4.1)
γc=1.50, γs=1.15 (EC2 Table 2.1N)
fcd=αcc·fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)

1.1. Dimensions and loads

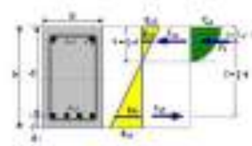
Slab thickness h=0.500 m, Bending moment Med=523.00 kNm (ULS), Med=150.00kNm (SLS)
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=40+16/2=48mm, d=500-48=452mm

1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Med(ULS)=523.00 kNm/m
Dimensioning for bending: Allgower,G.-Avak,R. Bemessungstafeln nach Eurocode 2
fur Rechteck und Plattenbalkenquerschnitte, in: Beton - und Stahlbetonbau 87 (1992)
(σc=fcd[1-(1-εc/εc2)ⁿ], fcd=17.00MPa, εc2=0.0020, εcu2=0.0035, fyd=435MPa)
Med=523.00kNm/m, d=452mm, Kd= 1.98 x/d=0.20 εc2/εs1=-3.5/13.7 ks=2.51, **As=29.05cm²/m**
Minimum slab reinforcement, Asmin=0.26bd·fctm/fyk, (As= 6.00cm²/m) (EC2 §9.3.1)
minimum principal reinforcement Ø16/29.5 (6.81cm²/m) , secondary Ø16/34.5 (5.83cm²/m)

Slab principal reinforcement Ø16/12.5(20.11cm²/m) , **secondary Ø16/34.5** (5.83cm²/m)

1.2.1. Ultimate moment capacity of cross section (EC2 EN1992-1-1:2004, §6.1)



b=1000mm, h=500mm, d=452mm, As1=3882mm²
εc2=-3.50/oo, εs1=12.67o/oo, As1/b·d=0.00859(0.859%)
x/d=εc2/(εc2+εs1)=3.50/(3.50+12.67)=0.216, x=97.5mm
αr=0.810, ka=0.416, Fc=αr·b·x·fcd=Fs1=1346.40kN, As1=Fs1/fyd=3096mm²/m
z=d-ka·x=(1-ka·εc2/(εc2+εs1))d, z/d=1.0-0.416x0.216=0.910, z=411.3mm
Kd²=1/(0.810·0.216·0.910·17.00)=0.369 mm²/N, Kd=0.607
Bending capacity Mr=b·d²/Kd²=0.000001x1000x452²/0.369=554.00kNm

1.3. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

Med(SLS)=150.00 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.30o/oo
γc=1.00, γs=1.00 (EC2 §2.4.2.4(2))
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq. 7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø16/65
Reinforcement ratio ρ=As1/(b·d)=3882/(1000x452)=0.007

1.3.1. State I (uncracked section) (SLS)
Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x10.417)=95216 kNm²
S=As.zs1=(0.001)²x3882x0.202=(0.001)x0.625 m³ (EC2 Eq. 7.21)
Curvature due to moment 1/rm=150.000/95216=(0.001)x1.575 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.625/10.417)=(0.001)x0.394(1/m)
Total curvature 1/r=(0.001)x1.575+(0.001)x0.394=(0.001)x1.969(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(10.417/0.250)=120.83 kNm

1.3.2. State II (fully cracked section) (SLS)

ρ=As/(b·d)=0.007, n=αe=21.88, n·ρ=0.153, ξ=0.498, ζ=0.421, z=x·d=0.190m
Bending stiffness of fully cracked section, EI=ξ·Es·As·d²=0.498x200x3092x0.451²=62872 kNm²
S=As.zz1=(0.001)²x3092x0.282=(0.001)x0.909 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=150.000/62872=(0.001)x2.386 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.909/8.879)=(0.001)x0.510(1/m)
Total curvature 1/r=(0.001)x2.386+(0.001)x0.510=(0.001)x2.896(1/m)
Med=150.00 kNm, σc/σs=0.45/0.62, x=190mm, σs=115 N/mm²

1.3.3. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)

ξ=1-0.50·(Mcr/Med)²=1-0.50x(120.83/150.00)²=0.68 (Eq.7.19)
Final curvature (1/r)=0.68x(0.001x2.896)+(1-0.68)x(0.001x1.969)=(0.001)x2.595(1/m) (Eq.7.18)

1.3.4. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.500m, d=0.452m, x=0.190m, Ø=16mm
Ned=0.00kN, σc=(Ned/bh)=0.0N/mm², σs=125N/mm²
Act=(h-x)·b=(500-190)x1000=309661 mm²
max(h,b1)=1mm, fctm=2.90N/mm², Ac,eff=309661mm², k=0.86, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x0.86x2.90x309661/125=2474mm²/m

1.3.5. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

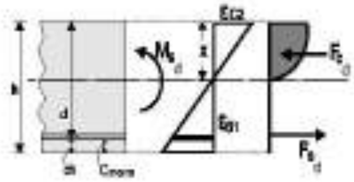
Wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=125N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(500-190)x1000=103117 mm² (§7.3.2.3)
ρeff=As/Ac,eff=3092/103117=0.030
εsm-εcm=[125-0.4x(2.9/0.030)(1+21.88x0.030)]/200=0.30 ε/εcm=0.6x125/200=0.37 ε/εs
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=16mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x40.00+0.8x0.5x0.425x16/0.030=226.71 mm
Wk=sr,max·(εsm-εcm)=226.71x0.001x0.37=0.08 mm

Dimenionimi i seksionit te murit anesor per drejtimin gjatesor

1. SLAB-002

Cross section of solid slab in bending
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)

h=0.500 m, Med=412.00 kNm
Concrete-Steel class: C30/37-B500C (EC2 §3)
Environmental class : XC1 (EC2 §4.4.1)
Concrete cover : Cnom=40 mm (EC2 §4.4.1)
γc=1.50, γs=1.15 (EC2 Table 2.1N)
fcd=αcc·fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)



1.1. Dimensions and loads

Slab thickness h=0.500 m, Bending moment Med=412.00 kNm (ULS), Med=288.48kNm (SLS)
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=40+16/2=48mm, d=500-48=452mm

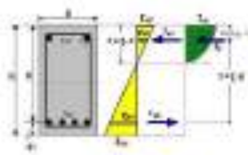
1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.2.1)

Med(ULS)=412.00 kNm/m
Dimensioning for bending: Allgower,G.-Avak,R. Bemessungstafeln nach Eurocode 2
fur Rechteck und Plattenbalkenquerschnitte, In: Beton - und Stahlbetonbau 87 (1992)
(σc=fcd[1-(1-εc/εc2)²], fcd=17.00MPa, εc2=0.0020, εcu2=0.0035, fyd=435MPa)
Med=412.00kNm/m, d=452mm, kd= 2.23 x/d=0.16 εc2/εs1=-3.5/18.8 ks=2.46, **As=22.40cm²/m**
Minimum slab reinforcement, As0=0.26bd·fctm/fyk, (As= 6.80cm²/m) (EC2 §9.3.1)
minimum principal reinforcement Ø16/28.5 (6.91cm²/m) , secondary Ø16/44.5 (4.52cm²/m)

Slab principal reinforcement Ø16/13.0 (22.73cm²/m) , **secondary Ø16/44.5** (4.52cm²/m)

1.2.1. Ultimate moment capacity of cross section (EC2 EN1992-1-1:2004, §6.1)

b=1000mm, h=500mm, d=452mm, As1=2233mm²
εc2=-3.50/oo, εs1=18.89/oo, As1/b·d=0.00495(0.495%)
x/d=εc2/(εc2+εs1)=3.50/(3.50+18.89)=0.156, x=70.7mm
αr=0.810, ka=0.416, Fc=αr·b·x·fcd=Fs1=972.37kN, As1=Fs1/fyd=2235mm²/m
z=d-ka·x=(1-ka·εc2/(εc2+εs1))d, z/d=1.0-0.416x0.156=0.935, z=422.6mm
Kd²=1/(0.810·0.156·0.935·17.00)=0.497 m²/MN, Kd=0.705
bending capacity Mr=b·d²/Kd²=0.000001x1000x452²/0.497=411.00kNm



1.3. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

Med(SLS)=288.48 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.20o/oo
γc=1.00, γs=1.00 (EC2 §2.4.2(4.2))
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq.7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø16/13
Reinforcement ratio ρ=As1/(b·d)=2233/(1000x452)=0.005

1.3.1. State I (uncracked section) (SLS)
Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x10.417)=95216 kNm²
S=As.zs1=(0.001)²x2233x0.202=(0.001)x0.451 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=288.480/95216=(0.001)x3.029 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.20)x21.880x(0.451/10.417)=(0.001)x0.284(1/m)
Total curvature 1/r=(0.001)x3.029+(0.001)x0.284=(0.001)x3.313(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(10.417/0.250)=120.83 kNm

1.3.2. State II (fully cracked section) (SLS)

ρ=As/(b·d)=0.005, n=αe=21.88, n·ρ=0.109, ξ=0.551, α=0.371, x=ξ·d=0.168m
Bending stiffness of fully cracked section, EI=ξ·Es·As·d²=0.551x200x2233x0.452²=50296 kNm²
S=As.zs1=(0.001)²x2233x0.284=(0.001)x0.635 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=288.400/50296=(0.001)x5.734 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.635/5.503)=(0.001)x0.400(1/m)
Total curvature 1/r=(0.001)x5.734+(0.001)x0.400=(0.001)x6.134(1/m)
Med=288.40 kNm, xc/xs=0.96/1.63, x=168mm, σs=326 N/mm²

1.3.3. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)

ζ=1-0.50·(Mcr/Med)²=1-0.50x(120.83/288.40)²=0.91 (Eq.7.19)
Final curvature (1/r)=0.91x(0.001x6.134)+(1-0.91)x(0.001x3.313)=(0.001)x5.887(1/m) (Eq.7.18)

1.3.4. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.500m, d=0.452m, x=0.168m, Ø=16mm
Ned=0.00kN, σc=(Ned/bh)=0.0N/mm², σs=326N/mm²
Act=(h-x)·b=(500-168)x1000=332315 mm²
max(h,b1)=1mm, fctm=2.90N/mm², Ac,eff=332315mm², k=0.86, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x0.86x2.90x332315/326=1017mm²/m

1.3.5. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=326N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(500-168)x1000=110661 mm² (§7.3.2.3)
ρeff=As/Ac,eff=2233/110661=0.020
εsm-εcm=[326-0.4x(2.9/0.020)(1+21.88x0.020)]/200=1.22 o/oo>=0.6x326/200=0.98 o/oo
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=16mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x40.00+0.8x0.5x0.425x16/0.020=270.80 mm
wk=sr,max·(εsm-εcm)=270.80x0.001x1.22=0.33 mm

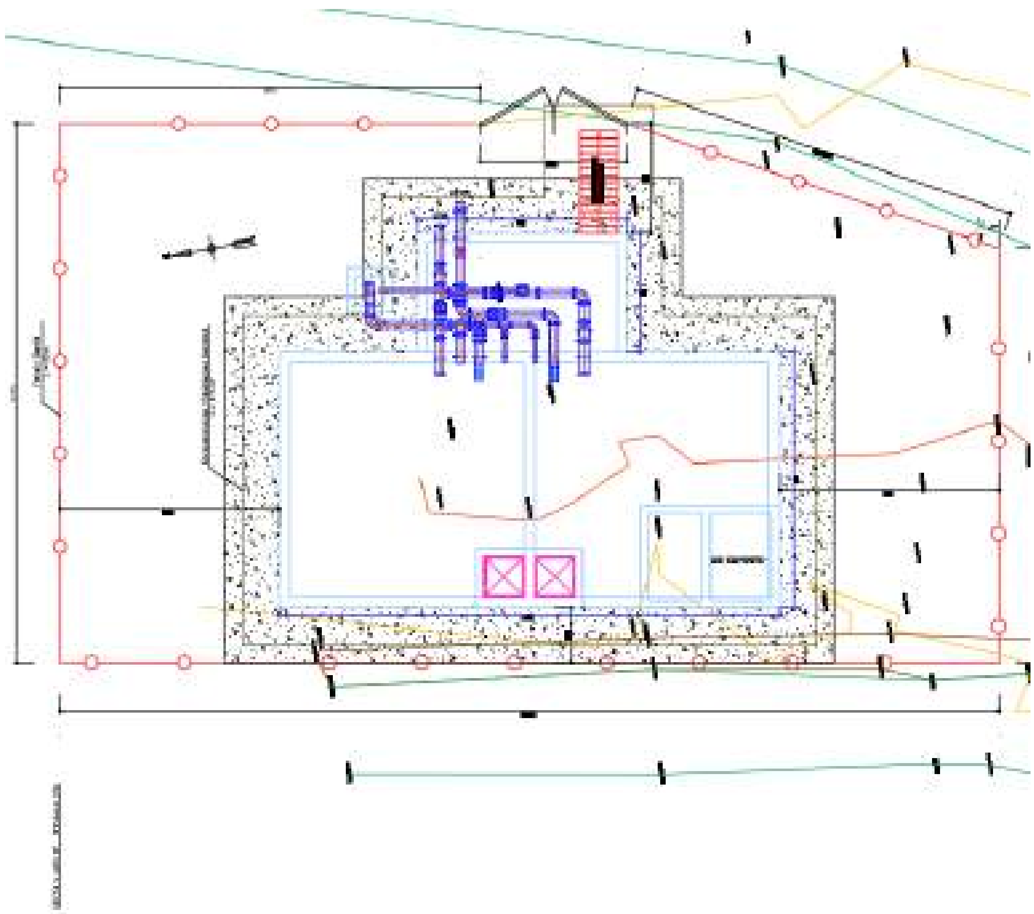
9. Llogaritja konstruktive e depos se ujit 250 m3.

Llogaritja e Depos se ujit 250 m3 eshte bere ne perputhje me rekomandimet e normativave europiane Eurocode 2, 7 dhe 8.

Depoja perbehet nga tre dhoma te cilat komunikojne me njera tjetren nepermjet 2 hapesirave me dimensione 6.4 m x 6.4 m,H=3.5m sic tregohet ne fuguren 1.

Muret e struktures jane me trashesi 30 cm me beton C25/30.

Themeli eshte i tipit pllake me trashesi 50 cm. Soleta eshte tip monolit me trashesi 20 cm me sistem te kryqezuar traresh.



2. Plani i depos V=250m3

16.2.Pershkrimi i struktures

16.1.2 Materialet e perdorura

Betoni

Jetegjatesia e vepres - 100 vite

Klasa e ekspozimit: XD2 (Muret, kolonat, pllaka e themelit)

Klasa e ekspozimit: XC2/XC3 (soleta)

Klasa e betonit: C25/30

Hekuri i armimit

Klasa e hekurit: "B" f_{ys}=360MPa

Shtresa mbrojtese

Themeli: 5cm

Muret anesor: 5cm

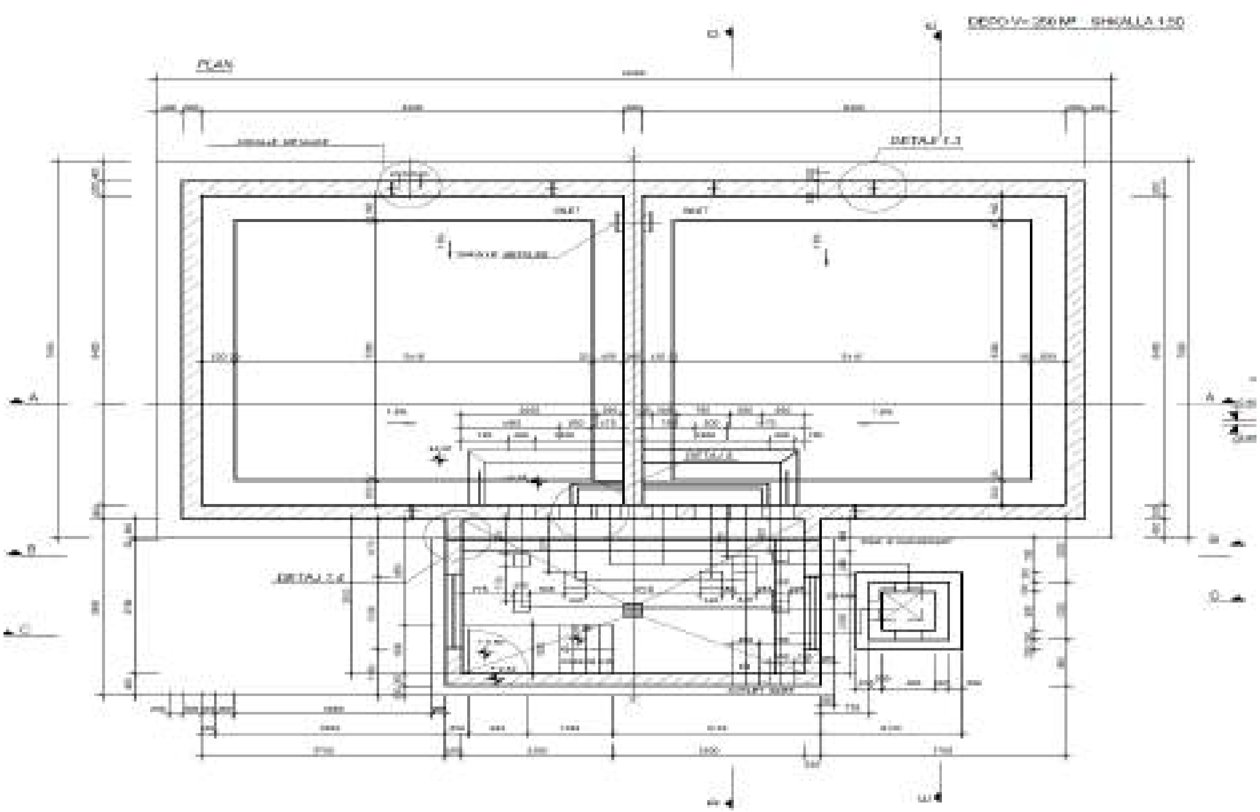
Kolonat: 5cm

Traret: 5cm

Soleta: 2.5cm

16.1.2 Dimensionet

Planimetria e struktures jepet ne fig.2-1. Skema e zgjedhur eshte me e pershtatshmja nga ana teknike dhe ekonomike.



Planimetri e depos me dimensione

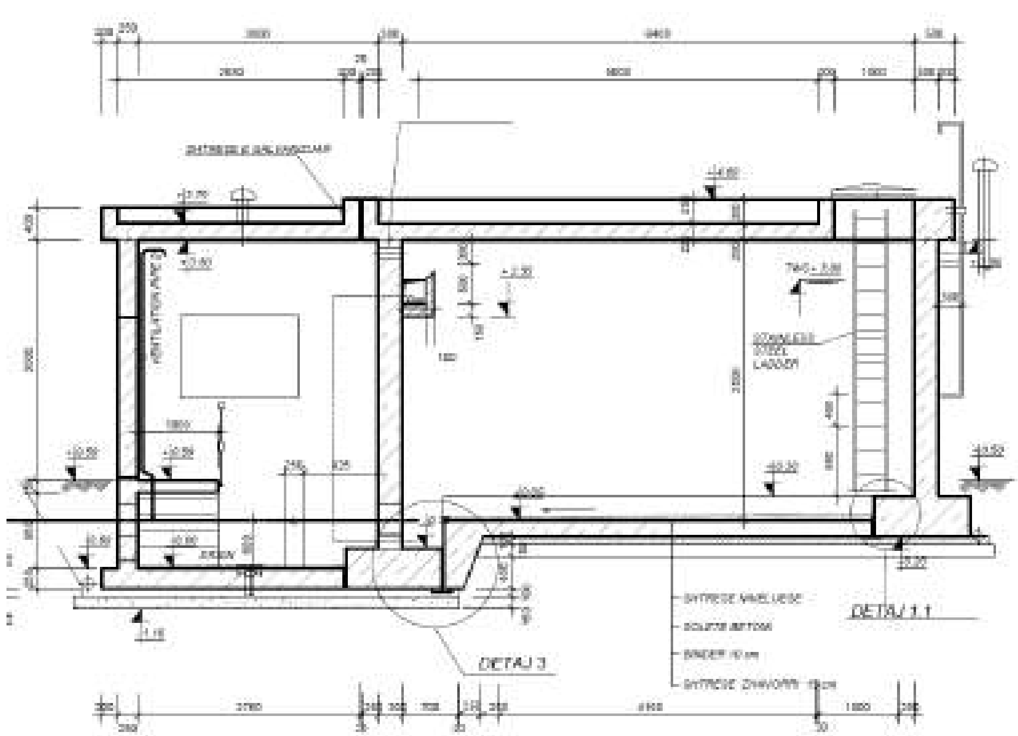
Dimensionet jepen ne figuren 2.1. Sejcila dhome e rezervuarit ka dimensione 6.4 m x 6.4 m; muret ndares midis dhomave jane me trashesi 30 cm dhe ka 2 hapesira komunikimi midis dhomave.

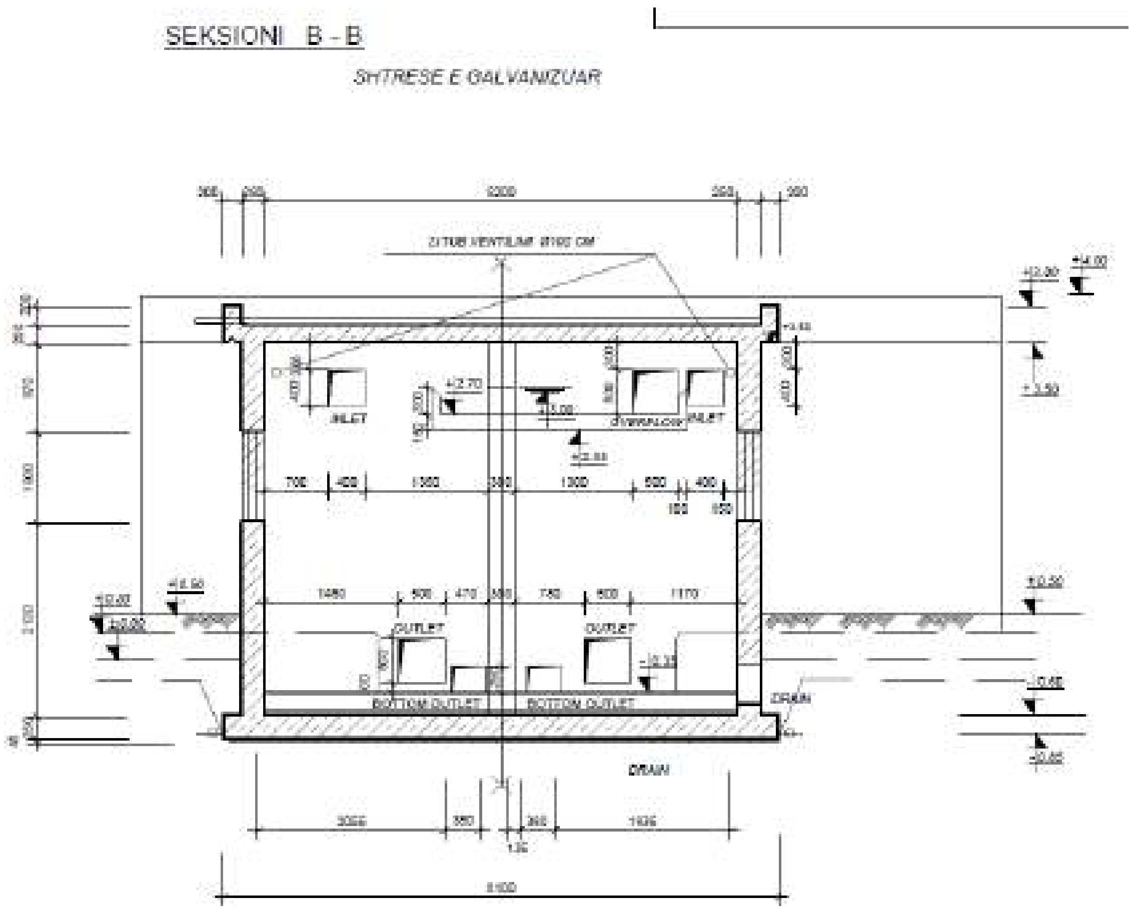
Dimensionet kryesore te rezervuarit jane:

- Dimensioni ne drejtimin gjatesor L = 14.1m (matur jashte faqeve te mureve)
- Dimensioni ne drejtimin terthor B = 7.4m (matur jashte faqeve te mureve)
- Soleta ka trashesi 20cm dhe eshte e armuar me hekur periodik.
- Muret perimetral kane trashesi 20cm.
- Muret ndares kane trashesi 30cm.
- Niveli maksimal i ujit eshte 3.0 m.

Ne figuren 2-2 jepet dhe prerja gjatesore sipas aksit te depos.

SEKSIONI D - D





Prerje terthore e depos

Ne menyre qe te permiresohen vetite fiziko-mekanike te themelit eshte parashikuar nje shtrese, 30 cm zhavor ose callek i fraksionuar dhe nje shtrrese 10 cm beton.

9.1 Metoda e projektimit

Te pergjithshme

Strukturat qe jane te desitinuara per depozitimin e ujit pervec se duhet te permbushin kushtet normale ne qendrushmeri, solidited dhe deformim etj. duhet te pernushin dhe kushtet per mos rrjedhje nepermjet betonit.

Ne projektimin e strukturave te tilla eshte e zakonshme qe nese dimensionimi elementet jane dimensioninuar dhe armuar per kushtet e mos-rrjedhjes atehere dhe soliditedi i elementeve eshte i garantuar. Strukturat uje-mbajtese eshte e rendesihme qe te dimensionohen duke patur parasysh kushte e mos-rrjedhjes se lengut, pasi nese nuk dimensionohen per keto kushte mirembajtja dhe riparimi i tyre eshte shume i kushtueshem. Nje tjeter kriter shume i rendesishem ne projektimin e strukturave uje-mbajtese eshte dhe projektimi i tyre per kushte extreme si psh termetet. Sipas Eurocode 8 keto tipe strukturash duhet te projektohen me faktor te sjelljes q=1.0 ose ne raste te vecanta q=1.5 qe dmth keto struktura duhet te jene funksionale dhe gjate termeteve te fuqishem shkaterues. Ne Eurocode kjo justifikohet me faktin se ujesjellesi furnizon me uje institucione te rendesishme si zjarr-fikeset, spitalet qendrat e emergjencave etj.

Standartet

Rezervuari do te llogaritet ne perputhje me metoden e gjendjeve kufitare.

Kodi ku do te bazohen llogaritjet eshte Eurocode, dhe me konkretisht:

- Eurocode 0, Bazat e projektimit.
- Eurocode 1, Forcat vepruese ne struktura
- EN 1991-1-5, Part 1-5: Forcat termike
- EN 1991-4, Part 4: Sillosat dhe rezervuaret
- Eurocode 2, Projektimi i strukturave betonarme
- EN 1992-1-1, Part 1-1: Rregulla te pergjithshme per ndertesat
- EN 1992-3, Part 3: Strukturat uje-mbajtese
- Eurocode 7, Projektimi gjeoteknik i strukturave betonarme
- EN 1997-1,Part 1: rregulla te pergjithshme.
-

Klasifikimi i forcave

Te perhershme

- Llogaritja e peshes vetiake te struktures

Soleta: 0.20m * 1m * 1m *25.0 kN/m^3 = 5.0 kN / m^2

Shtresat mbi solete:

Llac cimento; 0.06m * 1m * 1m *20.0 kN/m^3 = 1.200 kN / m^2)

Hidroizolim: 0.02m * 1m * 1m *18.0 kN/m^3 = 0.36 kN / m^2)

Muret anesore: 0.5m * 5.5m * 1m * 25.0 kN/m^3 = 68.75 kN (per ml mur)

Themeli: 0.5m * 1m * 1m * 25.0 kN/m^3 = 12.50 kN (per m^2)

Kolona: 0.5m * 0.5 m * 25.0 kN/m^3 = 6.25 kN (per ml kolone)

Pa=mbushja mbi solete: 0.5* 1m * 1m * 18 kN/m^3 = 9 kN (per m^2)

Presioni akstiv ne muret anesor: $p = \gamma * h * k_a$

ka- koeficienti i presionit aktiv (per kushte statike $\psi = 0$)

$$\frac{\left[\cos\left[(\phi - \psi - \beta)\cdot\frac{\pi}{180}\right]\right]^2}{\cos\left(\psi\cdot\frac{\pi}{180}\right)\cdot\cos\left(\beta\cdot\frac{\pi}{180}\right)\cdot\cos\left(\beta\cdot\frac{\pi}{180}\right)\cdot\cos\left[(\delta+\beta+\psi)\cdot\frac{\pi}{180}\right]\cdot\left[1+\sqrt{\frac{\sin\left[(\phi+\delta)\cdot\frac{\pi}{180}\right]\cdot\sin\left[(\phi-\psi-i)\cdot\frac{\pi}{180}\right]}{\cos\left[(\delta+\beta+\psi)\cdot\frac{\pi}{180}\right]\cdot\cos\left[(i-\beta)\cdot\frac{\pi}{180}\right]}}\right]^2}$$

kendi i ferkimit: $\phi = 20°$

inklinimi i murit; $\beta = 0°$

pjerresia e mbushjes: $i = 0°$

kendi i ferkimit mur-terren: $\delta = 13°$

duke aplikuar koeficientet e mesiperm ne formule marrim ka= 0.439.

Vlera e koeficientit te presionit aktiv per kushte sizmike (ag=0.22g) eshte: ka= 0.524.

Variable

Ne rastet kur ka presence uji diagram ndryshon fromen e saj. Pesha volumore e mbushjes llogaritet me formulen:

□$_a$ = □$_{sat}$ - □$_w$

Ku □$_{sat}$ eshte pesha volumore e materialit mbushes dhe □$_w$ eshte pasha volumore e ujit.

Vlera e presionit aktiv ne rastin e prezences se ujit eshte (ne fund te murit anesor):

- ne kushte statike

$$p_b = \gamma * h * k_a + \gamma_w * h = (20-10)\frac{kN}{m^3} * 5.5m * 0.439 + 10\frac{kN}{m^3} * 5.5m = 79.145\ \frac{kN}{m^2}$$

- ne kushte sizmike

$$p_b = \gamma * h * k_a + \gamma_w * h = (20-10)\frac{kN}{m^3} * 5.5m * 0.524 + 10\frac{kN}{m^3} * 5.5m = 83.82\ \frac{kN}{m^2}$$

Figure 10

Skema e ngarkesave te aplikuara

Presioni i ujit brenda rezervuarit:

- ne kushte statike:

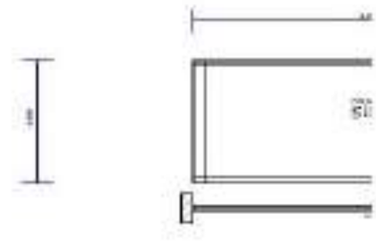
$$p_c = \gamma_w * h = 10 \frac{kN}{m^3} * 3.6m = 36.0 \frac{kN}{m^2}$$

Llogaritje e soletes

1. SLAB-001

Two-way slab
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)

C30/37-B500C



Concrete-Steel class: C30/37-B500C (EC2 §3)
Environmental class : XC4 (EC2 §4.4.1)
Concrete cover : Cnom=35 mm (EC2 §4.4.1)
Concrete weight : 25.0 kN/m³
γc=1.50, γs=1.15 (EC2 Table 2.1N)
fcd=αcc fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)

1.1. Dimensions and loads

Slab thickness h=0.200 m, Spans lx=6.050 m, ly=4.380 m
Slab loads: dead g=(5.00+2.00)=7.00 kN/m², live q=9.00 kN/m²
Partial safety factors for actions : γG=1.35, γQ=1.50 (EC0 Annex A1)
Combination of variable actions : ψ0=0.70, ψ1=0.60, ψ2=0.30
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=35+12/2=41mm, d=200-41=159mm

Method of analysis: Czerny F., "Tafeln fur vierseitig und dreiseitig gelagerte Rechteckplatten", Beton Kalender 1999, Berlin, Ernst Sohn, 1999
Ly/lx=4.380/6.050=0.72, Table 2.2.6

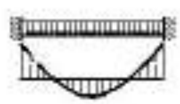
1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Load (STR) qed=γG g+γQ q=1.35g+1.50q=1.35x7.00+1.50x9.00=22.95 kN/m

1.2.1. Direction of slab analysis x-x, lx=6.05 m

Moment at support MedsupA=(1.35x7.00+1.50x9.00)x4.380²/17.50=-25.16 kNm/m
Moment at support MedsupB=(1.35x7.00+1.50x9.00)x4.380²/17.50=-25.16 kNm/m
Moment at span Medspan=(1.35x7.00+1.50x9.00)x4.380²/81.53= 5.40 kNm/m
Reactions dead, VgA= 7.00x4.380/2.09=14.67 VgB= 7.00x4.380/2.09=14.67 kN/m
Reactions live, VqA= 9.00x4.380/2.09=18.86 VqB= 9.00x4.380/2.09=18.86 kN/m

1.2.2. Direction of slab analysis y-y, ly=4.38 m



Moment at support MedsupA=(1.35x7.00+1.50x9.00)x4.380²/13.81=-31.88 kNm/m
Moment at support MedsupB=(1.35x7.00+1.50x9.00)x4.380²/13.81=-31.88 kNm/m
Moment at span Medspan=(1.35x7.00+1.50x9.00)x4.380²/32.42=13.58 kNm/m
Reactions dead, VgA= 7.00x4.380/1.93=15.91 VgB= 7.00x4.380/1.93=15.91 kN/m
Reactions live, VqA= 9.00x4.380/1.93=20.45 VqB= 9.00x4.380/1.93=20.45 kN/m

1.3. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Med= 5.40kNm/m, d=147mm, Kd= 6.33 x/d=0.04 εc2/εs1=-0.9/20.0 ks=2.33, **As= 0.86cm^2/m**
Med= 13.58kNm/m, d=159mm, Kd= 4.31 x/d=0.06 εc2/εs1=-1.3/20.0 ks=2.35, **As= 2.01cm^2/m**
Med=-25.16kNm/m, d=159mm, Kd= 3.17 x/d=0.09 εc2/εs1=-2.0/20.0 ks=2.38, **As= 3.77cm^2/m**
Med=-31.84kNm/m, d=159mm, Kd= 2.82 x/d=0.11 εc2/εs1=-2.4/20.0 ks=2.40, **As= 4.81cm^2/m**

Minimum slab reinforcement, As>=0.26bd·fctm/fyk, (As= 2.40cm^2/m) (EC2 §9.3.1)
minimum principal reinforcement Ø12/40.0 (2.82cm^2/m) , secondary Ø12/45.0 (2.40cm^2/m)

Span reinforcement:	**x-x**	**Ø12/25.0**	(2.82cm^2/m)
	y-y	**Ø12/25.0**	(2.82cm^2/m) , (bottom layer)
Reinforcement over supports:	**Left**	**Ø12/20.0**	(3.77cm^2/m)
	Right	**Ø12/20.0**	(3.77cm^2/m)
	Bottom	**Ø12/20.0**	(4.81cm^2/m)
	Top	**Ø12/20.0**	(4.81cm^2/m)

1.4. Ultimate limit state (ULS), Design for shear (EC2 EN1992-1-1:2004, §6.2, §9.2.2)

Maximum shear forces at distance d from support face maxV=50.33 kN/m
Shear capacity without shear reinforcement Vrdc (EC2 §6.2.2)
Vrdc=[Crdc·k·(100ρl·fck)$^{0.33}$+k1·σcp]·bw·d (EC2 Eq.6.2.a)
Vrdc>=(vmin+k1·σcp)·bw·d (EC2 Eq.6.2.b)
Crdc=0.18/γc=0.18/1.50=0.120, fck=30.00MPa ,bw=1000mm, d=159mm
k=1+ √(200/d) <=2, k=2.00, k1=0.15
ρl=Asl/(bw·d)=481/(1000x159)=0.0030
vmin=0.035·k$^{1.50}$·√fck = 0.54N/mm² (EC2 Eq.6.3N)
Vrd,c(min)=0.001x(0.54)x1000x159=85.86kN/m
Vrdc=0.001x[0.120x2.00x(0.30x30.00)$^{0.33}$]x1000x159=79.38, Vrdc=Vrdc(min)=85.86kN/m
Ved=50.33 kN/m <= Vrdc=85.86 kN/m, **Ved<=Vrdc shear reinforcement is not needed**

1.5. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

L=4.380m, b=1.000m, h=0.200m, d=0.159m
Load (quasi-permanent combination) qed=g+ψ2·q=7.00+0.30x9.00=9.70 kN/m
Ly<Lx, Leff=4.380m, Med=(9.70/22.95)x13.58=5.74 kNm/m, Med(SLS)=5.74 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.30e/oo
γc=1.00, γs=1.00 (EC2 §2.4.2.4.2)
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq.7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø12/400
Reinforcement ratio ρ=As1/(b·d)=282/(1000x159)=0.002

1.5.1. State I (uncracked section) (SLS)

Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x0.667)=6094 kNm²
S=As.zs1=(0.001)²x282x0.059=(0.001)x0.017 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=5.739/6094=(0.001)x0.942 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.017/0.667)=(0.001)x0.164(1/m)
Total curvature 1/r=(0.001)x0.942+(0.001)x0.164=(0.001)x1.106(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(0.667/0.100)=19.33 kNm

1.5.2. State II (fully cracked section) (SLS)

ρ=As/(b·d)=0.002, n=αe=21.88, n·ρ=0.044, ζ=0.681, ξ=0.255, x=ξ·d=0.041m
Bending stiffness of fully cracked section, EI=ζ·Es·As·d²=0.681x200x282x0.159²=971 kNm²
S=As.zs1=(0.001)²x282x0.118=(0.001)x0.033 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=5.739/971=(0.001)x5.908 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.033/0.106)=(0.001)x0.329(1/m)
Total curvature 1/r=(0.001)x5.908+(0.001)x0.329=(0.001)x6.236(1/m)
Med=5.74 kNm, εc/εs=0.24/0.70, x=41mm, σs=140 N/mm²

1.5.3. Checking deflections without calculation (SLS) (EC2 EN1992-1-1:2004, §7.4.2)

1/d=K[11+1.5 √fck(ρo/ρ)+3.2 √fck(ρo/ρ-1) 3/2]=110.52 (EC2 Eq.7.16a)
fck=30.00N/mm², ρo=0.001x √30.00=0.005, ρ=0.002, ρ'=0.000, ρ<=ρo, K=1.5
1/d=(310/σs)x(1/d), σs=240 N/mm², 1/d=(310/140)x110.52=244.89 (EC2 Eq.7.17)
leff/d=4.380/0.159=27.55 <= 244.89, **Span/depth under limits**

1.5.4. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)
Med=5.74<0.70xMcr=0.70x19.33=13.53 kNm, ζ=0.00 (Eq.7.19)
Final curvature (1/r)=0.00x(0.001x6.236)+(1-0.00)x(0.001x1.106)=(0.001)x1.106(1/m) (Eq.7.18)
β=(Ma+Mb)/Mc=(31.88+31.88)/13.58=4.69, k=0.104(1-4.69/10)=0.0552
f=k·Leff²·(1/r)=0.0552x4.380²x1.106=1.2 mm
f=1.17 <= 1000x4.380/250=17.5 mm, **Deflection under limits**

1.5.5. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.200m, d=0.159m, x=0.041m, Ø=12mm
Ned=0.00kN, σc=(Ned/bh)=0.0N/mm², σs=140N/mm²
Act=(h-x)·b=(200-41)x1000=159408 mm²
max(h,b1)=0mm, fctm=2.90N/mm², Ac,eff=159408mm², k=1.00, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x1.00x2.90x159408/140=1322mm²/m

1.5.6. Control of cracking without direct calculation (SLS) (EC2 EN1992-1-1:2004, §7.3.4)

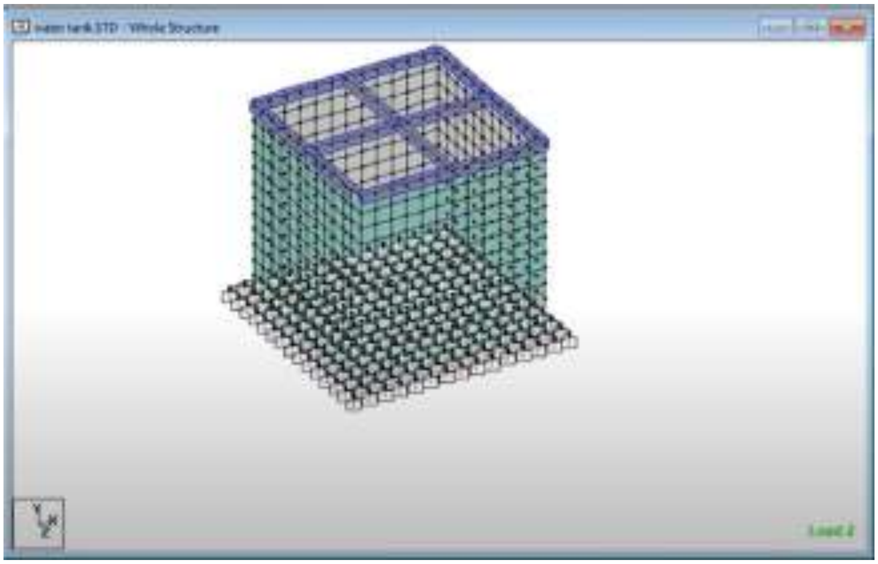
crack width wk=0.3mm(XC4), steel stress σs=140N/mm², Φ*=25mm, max s=250mm (EC2 T.7.2N T.7.3N)
Øs=Ø*(fctm/2.9)[kc·hcr/(2(h-d))]=13mm (EC2 Eq.7.6N)
fctm=2.90N/mm², kc=0.40, hcr=0.5x200=100mm, h=200mm, d=159mm
Maximum bar diameter Ø=13 mm , maximum bar spacing s=250 mm
Bar diameter Ø=12<=13 mm, **Bar diameter under maximum limit**

1.5.7. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=140N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(200-41)x1000=53083 mm² (§7.3.2.3)
ρeff=As/Ac,eff=282/53083=0.005
εsm-εcm=[140-0.4x(2.9/0.005)(1+21.88x0.005)]/200=-0.53 o/oo>=0.6x140/200=0.42 o/oo
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=12mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x35.00+0.8x0.5x0.425x12/0.005=503.00 mm
wk=sr,max·(εsm-εcm)=503.00x0.001x0.42=0.21 mm
wk=0.21 mm <= 0.30 mm =wmax, Environmental class: XC4, **Crack width under limit**

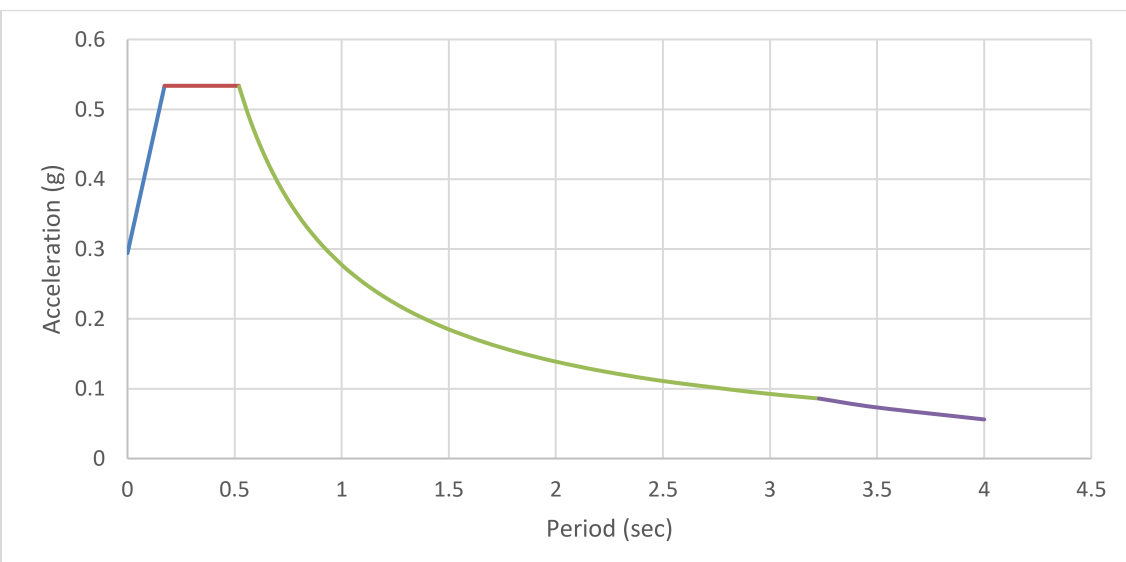
Skema statike e rezervuarit

Rezervuari eshte llogaritur me ndihmen e software-it Sap2000 duke e modeluar sipas metodes se Elementeve te Fundem.



Pamje 3D e rezervuarit

Skema e llogaritjes e plakes se themelit eshte si pllake mbi bazament elastik. Efekti i deformimit te dheut nen themel do te meret parasysh duke vendosur ne modelin llogarites susta. The foundation scheme is: slab of elastic soil. The soil will be modelled with springs that reflect the soil deformation characteristics.



11 spektri reagimit

Te dhena sizmike

Sipas hartes sizmike te Shqiperise zona ku do ndertohet rezervuari eshte zone me intensitet te larte sizmik, dhe i perket shkalles 8 sipas klasifikimit MSK-64. Akseleracioni sizmik eshte mare a_g=0.22. Kategoria e truallit sipas klasifikimit te Eurocode 7 eshte kategoria C. Faktori I sjelljes per projektimin sipas gjendjeve kufitare eshte q=1 per gjendjen kufitare te sherbimit dhe q=1.5 per gjendjen kufitare te shkaterimit.

Kontrolli i plasaritjeve

Per kontrollin e plasaritjeve eshte pranuar qe ato te behen sipas klases 2 qe jep Eurocode.
Klasa 2 dhe 3 parashikon qe plasaritjet te mos jene te vazhduara ne gjeresine e seksionit.

Rekomandime per madhesine e plasaritjeve per klasen 2 jepen ne EN1992-3:

Rekomandimi per madhesine e plasaritjeve eshte funksion i koeficientit h_D/ h:

$h_D/ h \leq 5$ wk1 is 0,2 mm
$h_D/ h \geq 35$ wk1 is 0,05 mm.

Rezultatet e llogaritjeve

Ne paragrafin me poshte jepet dhe llogaritja e detajuaj e momenteve ne muret anesor.

Analiza sizmike ne moden impulsive dhe konvektive:

Analiza sizmike ne drejtimin y-y:

a-3 Pesha e themelit te rezervuarit

$$W_f := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} = 2543.625 \quad [kN]$$

Masa e themelit te rezervuarit

$$m_f := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} \cdot 1000}{9.81} = 259289 \quad [kg]$$

a-4 Pesha e ujit

$$W_{wat} := L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} = 6326.64 \quad [kN]$$

Masa e ujit

$$m_{wat} := \frac{L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} \cdot 1000}{9.81} = 644917 \quad [kg]$$

Analiza ne drejtimin gjatesor

a- Parametrat e modelit suste - mas

$$\frac{m_i}{m_{wat}} = \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 0.274 \qquad m_i := m_{wat} \cdot \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 176719 \quad [kg]$$

$$h_i := d_w \cdot 0.375 = 1.35 \qquad \text{for } d_w / L_r < 0.75$$

$$h_{i1} := 0.5 - \frac{0.09375}{\frac{d_w}{L_r}} = 0.105 \qquad \text{for } d_w / L_r > 0.75$$

for d_w / L_r <1.33

$$\frac{h_{ig0}}{d_w} = \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 1.7$$

$$h_{iyll} := d_w \cdot \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 6.4 \qquad [m]$$

$$\frac{m_c}{m_{wat}} = 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 0.71$$

$$m_c := m_{wat} \cdot 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 455467 \qquad [kg]$$

$$\frac{h_c}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 0.52$$

$$h_c := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 1.88 \qquad [m]$$

$$\frac{h_{cyll}}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 2.16$$

$$h_{cyll} := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 7.8 \qquad [m]$$

$$K_c := 0.833 \cdot \frac{m_{vat} \cdot 9.81}{d_w} \cdot \left(\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)\right)^2 = 5.916 \cdot 10^5$$ [N/m]

b- Perioda e lekundjeve

b-1 Perioda ne moden impulsive

$$m_{w.def} := B_r \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot \frac{1000}{9.81} = 70948$$ [kg] [masa e murit te rez. ne drejtimin pingul me sizmen]

$$h_{def} := \frac{\frac{m_i}{2} \cdot h_i + m_{w.def} \cdot \frac{d_w}{2}}{\frac{m_i}{2} + m_{w.def}} = 1.55$$ [m]

$$q_{def} := \frac{\left(\frac{m_i}{2} + m_{w.def}\right) \cdot 9.81}{B_r \cdot d_w \cdot 1000} = 37$$ [kN/m2]

Deformimi i mureve nen veprimin e presionit q_{def} ne lartesine h_{def} eshte:

$d_{def} := 0.0065$ [mm]

Perioda ne moden impulsive $Ti := 2 \cdot \pi \cdot \sqrt{\frac{d_{def}}{9.81}} = 0.162$

b-2 Perioda ne moden konvektive

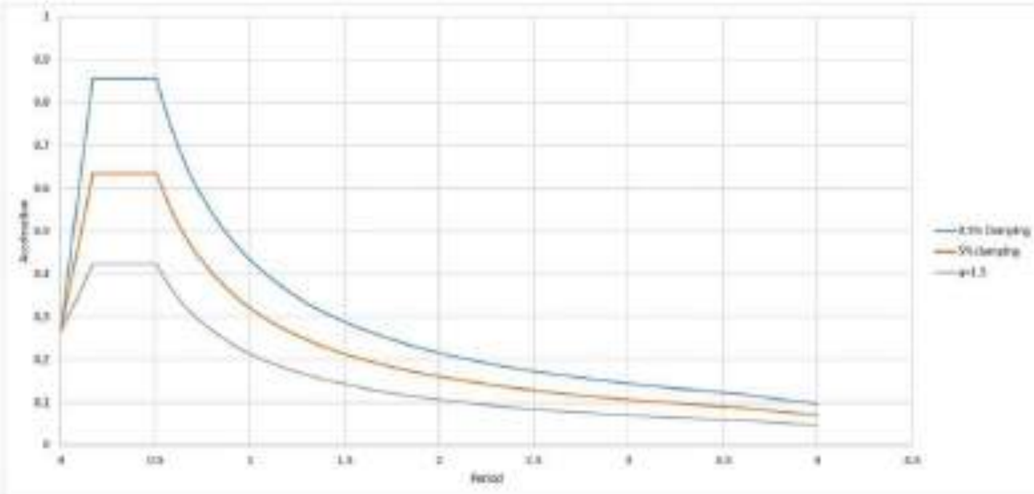
$C_c := 4.25$ [coefficient of convective mode time period]

$$T_c := C_c \cdot \sqrt{\frac{L_r}{9.81}} = 5.282$$ [sec]

c -forca prerese ne baze

Sjellja elastike do te modifikohet duke mare parasysh efektin e reduktimit si pasoje e krijimit te kunder-valeve

$$\eta := \sqrt{\frac{10}{5+0.5}} = 1.348$$



$S_{eTimp} := 0.385$ [vlera e projektit per moden impulsive]

$S_{eTcon} := 0.1$ [vlera e projektit per moden konvective]

$$Q := \left(\left(m_i + m_w + m_s\right) \cdot S_{eTimp} + m_c \cdot S_{eTcon}\right) \cdot \frac{9.81}{1000} = 2834 \quad \text{[kN]}$$

d - Momentet perkulese

$h_w := 2.4$ [m] qendra e gravitetit te murit

$h_s := 4.9$ [m] qendra e gravitetit e soletes

d-1 Momenti perkules ne fund te murit ne moden impulsive

$$M_{imp} := \left(m_i \cdot h_i + m_w \cdot h_w + m_s \cdot h_s\right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 6008 \quad \text{[kNm]}$$

d-2 Momenti perkules ne fund te murit ne moden konvektive

$$M_{con} := m_c \cdot h_c \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 840 \quad \text{[kNm]}$$

$$M_{total} := \sqrt{M_{imp}^{2} + M_{con}^{2}} = 6067 \quad [kNm] \qquad M_{total.1m} := \frac{M_{total}}{B_r} = 523 \quad [kNm]$$

e- Momentet

e1- Momentet perkulese ne fund te murit ne moden impulsive

$$M_{imp.over} := \left(m_i \cdot \left(h_{cyli} + d_f\right) + m_w \cdot \left(h_w + d_f\right) + m_s \cdot \left(h_s + d_f\right)\right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 10602 \quad [kNm]$$

e2- Momentet perkulese ne fund te murit ne moden konvektive

$$M_{con.over} := m_c \cdot \left(h_{cyll} + d_f\right) \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 3691 \quad [kNm]$$

$$M_{total.over} := \sqrt{M_{imp.over}^{2} + M_{con.over}^{2}} = 11226 \quad [kNm]$$

f- Presioni hidrodinamik

f1- Presioni hidrodinamik ne moden impulsive

ne murin anesor

$$y_1 := 0 \qquad Q_{iw} := 0.866 \cdot \left(1 - \left(\frac{y_1}{d_w}\right)^2\right) \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right) = 0.865$$

$$p_{iw1} := Q_{iw} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 11.986 \quad [kN/m2]$$

ne baze te themelit

$$x_1 := \frac{L_r}{2} \qquad Q_{ib} := \frac{\sinh\left(1.732 \cdot \frac{x_1}{L_r}\right)}{\cosh\left(0.866 \cdot \frac{L_r}{d_w}\right)} = 0.051$$

$$p_{iw2} := Q_{ib} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 0.708 \quad [kN/m2]$$

f2- Presioni hidrodinamik ne moden konvektive

ne muret anesor

$y_{c1} := 0$ $\qquad Q_{cu1} := 0.4165 \cdot \dfrac{\cosh\left(3.162 \cdot \dfrac{y_{c1}}{L_r}\right)}{\cosh\left(3.162 \cdot \dfrac{d_w}{L_r}\right)} = 0.321$

$p_{cu1} := Q_{cu1} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.87$ [kN/m2]

ne baze te themelit

$y_{c2} := d_w$ $\qquad Q_{cu2} := 0.4165 \cdot \dfrac{\cosh\left(3.162 \cdot \dfrac{y_{c2}}{L_r}\right)}{\cosh\left(3.162 \cdot \dfrac{d_w}{L_r}\right)} = 0.417$

$p_{cu2} := Q_{cu2} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 6.31$ [kN/m2]

f3- Presioni hidrodinamik ne moden konvektive ne baze (y=0)

$y_{cb} := 0$ $\qquad x_2 := \dfrac{L_r}{2}$ $\qquad Q_{cb} := 1.25 \cdot \left(\dfrac{x_2}{L_r} - \dfrac{4}{3} \cdot \left(\dfrac{x_2}{L_r}\right)^3\right) \cdot \operatorname{sech}\left(3.162 \cdot \dfrac{d_w}{L_r}\right) = 0.322$

$p_{cb} := Q_{cb} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.871$ [kN/m2]

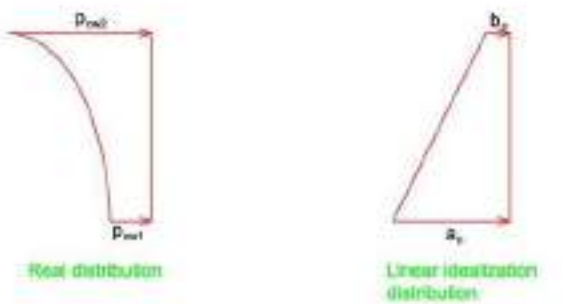
g- Presioni nga inercia e mureve anesor

$p_{ww} := S_{eTimp} \cdot d_r \cdot \gamma_{conc} = 4.813$ [kN/m2]

h- Presioni nga sizma vertikave

$S_{eTv} := 0.25$ $\qquad y_v := 0$ $\qquad p_v := S_{eTv} \cdot \left(\gamma_{wat} \cdot d_w \cdot \left(1 - \dfrac{y_v}{d_w}\right)\right) = 9$ [kN/m2]

$$b_c := \frac{q_c}{{d_w}^2} \cdot (6 \cdot h_i - 2 \cdot d_w) = 1.337$$ [kN/m2]



lartesia e vales gjate sizmes

$$R_{fix} := 2$$

$$d_{wave.max} := S_{sTcom} \cdot R_{fix} \cdot \frac{L_r}{2} = 1.515$$

16.2.1. **naliza sizmike ne drejtimin x- x**

Te dhena

$L_r := 11.60$	[m]	dimensioni i depos ne drejtimin gjatesor
$B_r := 15.15$	[m]	dimensioni i dhomes se depos ne drejtimin terthor
$h_r := 4.8$	[m]	lartesia e rezervuarit
$d_r := 0.5$	[m]	trashesia e murit
$d_s := 0.20$	[m]	trashesia e soletes
$d_f := 0.5$	[m]	trashesia e themelit
$d_w := 3.6$	[m]	niveli ujit
$\gamma_{conc} := 25$	[kN/m3]	pesha volumore e betonit
$\gamma_{wat} := 10$	[kN/m3]	pesha volumore e ujit

a- Llogaritja e peshave

a-1 Pesha e mureve te rezervuarit

$$W_w := 2 \cdot (L_r + 2 \cdot d_r + B_r + 2 \cdot d_r) \cdot d_r \cdot h_r \cdot \gamma_{conc} = 3450 \qquad \text{[kN]}$$

Masa e mureve te rezervuarit

$$m_w := \frac{2 \cdot (L_r + 2 \cdot d_r + B_r + 2 \cdot d_r) \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot 1000}{9.81} = 351682 \qquad \text{[kg]}$$

a-2 Pesha e soletes se rezervuarit

$$W_s := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_s \cdot \gamma_{conc} = 1017.45 \qquad \text{[kN]}$$

Masa e soletes se rezervuarit

$$m_s := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_s \cdot \gamma_{conc} \cdot 1000}{9.81} = 103716 \qquad \text{[kg]}$$

a-3 Pesha e themelit te rezervuarit

$$W_f := (L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} = 2543.625 \quad [kN]$$

Masa e themelit te rezervuarit

$$m_f := \frac{(L_r + 2 \cdot d_r) \cdot (B_r + 2 \cdot d_r) \cdot d_f \cdot \gamma_{conc} \cdot 1000}{9.81} = 259289 \quad [kg]$$

a-4 Pesha e ujit

$$W_{wat} := L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} = 6326.64 \quad [kN]$$

Masa e ujit

$$m_{wat} := \frac{L_r \cdot B_r \cdot d_w \cdot \gamma_{wat} \cdot 1000}{9.81} = 644917 \quad [kg]$$

Analiza ne drejtimin gjatesor

a- Parametrat e modelit suste - mas

$$\frac{m_i}{m_{wat}} = \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 0.356 \qquad m_i := m_{wat} \cdot \frac{\tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)}{0.866 \cdot \frac{L_r}{d_w}} = 229381 \quad [kg]$$

$$h_i := d_w \cdot 0.375 = 1.35 \qquad \text{for } d_w / L_r < 0.75$$

$$h_{i1} := 0.5 - \frac{0.09375}{\frac{d_w}{L_r}} = 0.198 \qquad \text{for } d_w / L_r > 0.75$$

for $d_w / L_r < 1.33$

$$\frac{h_{ipII}}{d_w} = \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 1.28$$

$$h_{cyli} := d_w \cdot \frac{0.866 \cdot \frac{L_r}{d_w}}{2 \cdot \tanh\left(0.866 \cdot \frac{L_r}{d_w}\right)} - 0.125 = 4.9 \quad [m]$$

$$\frac{m_c}{m_{wat}} = 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 0.64$$

$$m_c := m_{wat} \cdot 0.264 \cdot \frac{\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)}{\frac{d_w}{L_r}} = 413303 \quad [kg]$$

$$\frac{h_c}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 0.54$$

$$h_c := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 1}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 1.93 \quad [m]$$

$$\frac{h_{cyli}}{d_w} = 1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)} = 1.44$$

$$h_{cyli} := d_w \cdot \left(1 - \frac{\cosh\left(3.16 \cdot \frac{d_w}{L_r}\right) - 2.01}{3.16 \cdot \frac{d_w}{L_r} \cdot \sinh\left(3.16 \cdot \frac{d_w}{L_r}\right)}\right) = 5.2 \quad [m]$$

$$K_c := 0.833 \cdot \frac{m_{wat} \cdot 9.81}{d_w} \cdot \left(\tanh\left(3.16 \cdot \frac{d_w}{L_r}\right)\right)^2 = 8.309 \cdot 10^5$$ [N/m]

b- Perioda e lekundjeve

b-1 Perioda ne moden impulsive

$$m_{w.def} := B_r \cdot d_r \cdot h_r \cdot \gamma_{conc} \cdot \frac{1000}{9.81} = 92661$$ [kg] [masa e murit te rez. ne drejtimin pingul me sizmen]

$$h_{def} := \frac{\frac{m_i}{2} \cdot h_i + m_{w.def} \cdot \frac{d_w}{2}}{\frac{m_i}{2} + m_{w.def}} = 1.551$$ [m]

$$q_{def} := \frac{\left(\frac{m_i}{2} + m_{w.def}\right) \cdot 9.81}{B_r \cdot d_w \cdot 1000} = 37$$ [kN/m2]

Deformimi i mureve nen veprimin e presionit q_{def} ne lartesine h_{def} eshte:

$d_{def} := 0.0068$ [mm]

Perioda ne moden impulsive $Ti := 2 \cdot \pi \cdot \sqrt{\frac{d_{def}}{9.81}} = 0.165$

b-2 Perioda ne moden konvektive

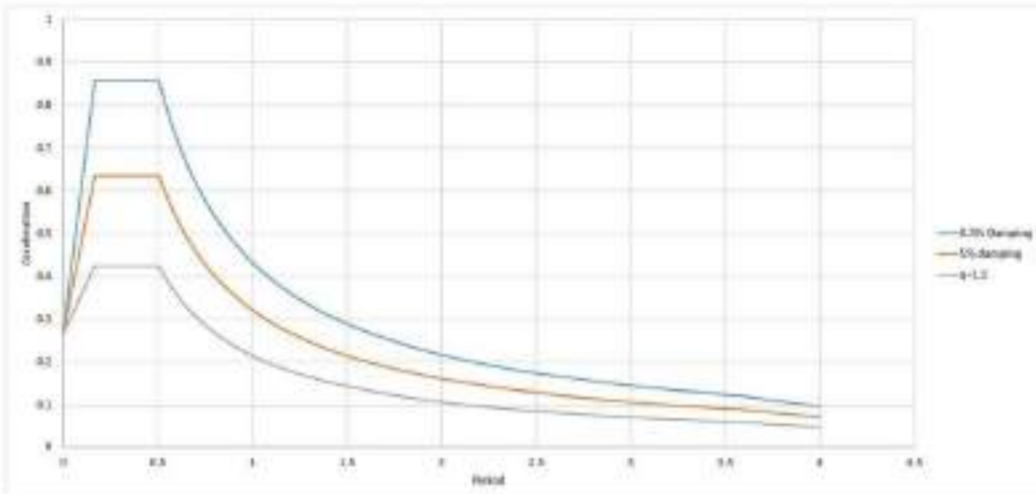
$C_c := 4.25$ [coefficient of convective mode time period]

$$T_c := C_c \cdot \sqrt{\frac{L_r}{9.81}} = 4.622$$ [sec]

c -forca prerese ne baze

Sjellja elastike do te modifikohet duke mare parasysh efektin e reduktimit si pasoje e krijimit te kunder-valeve

$$\eta := \sqrt{\frac{10}{5+0.5}} = 1.348$$



$S_{eTimp} := 0.380$ [vlera e projektit per moden impulsive]

$S_{eTcon} := 0.1$ [vlera e projektit per moden konvective]

$$Q := \left(\left(m_i + m_w + m_s \right) \cdot S_{eTimp} + m_c \cdot S_{eTcon} \right) \cdot \frac{9.81}{1000} = 2958$$ [kN]

d - Momentet perkulese

$h_w := 2.4$ [m] qendra e gravitetit te murit

$h_s := 4.9$ [m] qendra e gravitetit e soletes

d-1 Momenti perkules ne fund te murit ne moden impulsive

$$M_{imp} := \left(m_i \cdot h_i + m_w \cdot h_w + m_s \cdot h_s \right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 6195$$ [kNm]

d-2 Momenti perkules ne fund te murit ne moden konvektive

$$M_{con} := m_c \cdot h_c \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 783$$ [kNm]

$M_{total} := \sqrt{M_{imp}^{2} + M_{con}^{2}} = 6245$ [kNm] $\qquad M_{total.1m} := \frac{M_{total}}{B_{r}} = 412$ [kNm]

e- Momentet

e1- Momentet perkulese ne fund te murit ne moden impulsive

$$M_{imp.over} := \left(m_i \cdot \left(h_{iplI} + d_f\right) + m_w \cdot \left(h_w + d_f\right) + m_s \cdot \left(h_s + d_f\right)\right) \cdot S_{eTimp} \cdot \frac{9.81}{1000} = 10538 \text{ [kNm]}$$

e2- Momentet perkulese ne fund te murit ne moden konvektive

$$M_{con.over} := m_c \cdot \left(h_{cylI} + d_f\right) \cdot S_{eTcon} \cdot \frac{9.81}{1000} = 2298 \text{ [kNm]}$$

$$M_{total.over} := \sqrt{M_{imp.over}^{2} + M_{con.over}^{2}} = 10785 \text{ [kNm]}$$

f- Presioni hidrodinamik

f1- Presioni hidrodinamik ne moden impulsive

ne murin anesor

$$y_1 := 0 \qquad Q_{iw} := 0.866 \cdot \left(1 - \left(\frac{y_1}{d_w}\right)^2\right) \cdot \tanh\left(0.866 \cdot \frac{L_y}{d_w}\right) = 0.859$$

$$p_{iw1} := Q_{iw} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 11.758 \text{ [kN/m2]}$$

ne baze te themelit

$$x_1 := \frac{L_r}{2} \qquad Q_{ib} := \frac{\sinh\left(1.732 \cdot \frac{x_1}{L_r}\right)}{\cosh\left(0.866 \cdot \frac{L_r}{d_w}\right)} = 0.12$$

$$p_{iw2} := Q_{ib} \cdot S_{eTimp} \cdot \gamma_{wat} \cdot d_w = 1.637 \text{ [kN/m2]}$$

f2- Presioni hidrodinamik ne moden konvektive

ne muret anesor

$$y_{c1} := 0 \qquad Q_{cw1} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c1}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.274$$

$$p_{cw1} := Q_{cw1} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 3.176$$ [kN/m2]

ne baze te themelit

$$y_{c2} := d_w \qquad Q_{cw2} := 0.4165 \cdot \frac{\cosh\left(3.162 \cdot \frac{y_{c2}}{L_r}\right)}{\cosh\left(3.162 \cdot \frac{d_w}{L_r}\right)} = 0.417$$

$$p_{cw2} := Q_{cw2} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 4.831$$ [kN/m2]

f3- Presioni hidrodinamik ne moden konvektive ne baze (y=0)

$$y_{cb} := 0 \qquad x_2 := \frac{L_r}{2} \qquad Q_{cb} := 1.25 \cdot \left(\frac{x_2}{L_r} - \frac{4}{3} \cdot \left(\frac{x_2}{L_r}\right)^3\right) \cdot \mathrm{sech}\left(3.162 \cdot \frac{d_w}{L_r}\right) = 0.274$$

$$p_{cb} := Q_{cb} \cdot S_{eTcon} \cdot \gamma_{wat} \cdot L_r = 3.177$$ [kN/m2]

g- Presioni nga inercia e mureve anesor

$$p_{ww} := S_{eTimp} \cdot d_r \cdot \gamma_{conc} = 4.75$$ [kN/m2]

h- Presioni nga sizma vertikave

$$S_{eTv} := 0.25 \qquad y_v := 0 \qquad p_v := S_{eTv} \cdot \left(\gamma_{wat} \cdot d_w \cdot \left(1 - \frac{y_v}{d_w}\right)\right) = 9$$ [kN/m2]

k- Presioni hidrodinamik makimal

$$p := \sqrt{(p_{sw1} + p_{sw0})^2 + p_{ew1}^2 + p_v^2} = 19.068 \qquad [kN/m2]$$

m- Presioni linear ekuivalent

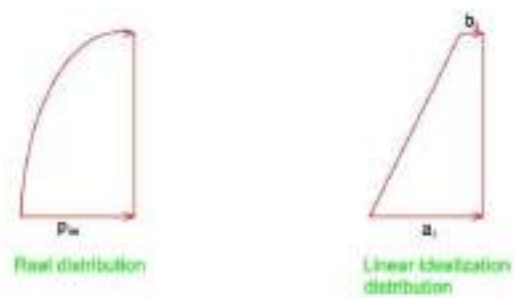
forca prerese per 1 ml ne baze per masen ne moden impulsive eshte

$$q_i := \frac{S_{eImp} \cdot m_i \cdot 9.81}{2 \cdot B_r \cdot 1000} = 28 \qquad [kN/m2]$$

vlera e presionit ekuivalent liear siper dhe poshte eshte

$$a_i := \frac{q_i}{d_w^2} \cdot (4 \cdot d_w - 6 \cdot h_i) = 13.718 \qquad [kN/m2]$$

$$b_i := \frac{q_i}{d_w^2} \cdot (6 \cdot h_i - 2 \cdot d_w) = 1.96 \qquad [kN/m2]$$



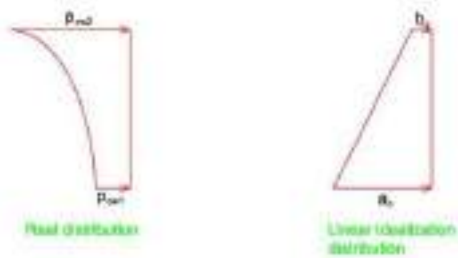
forca prerese per 1 ml ne baze per masen ne moden konvektive

$$q_c = \frac{S_{eCon} \cdot m_c \cdot 9.81}{2 \cdot B_r \cdot 1000} = 13 \qquad [kN/m2]$$

vlera e presionit ekuivalent liear siper dhe poshte eshte

$$a_c = \frac{q_c}{d_w^2} \cdot (4 \cdot d_w - 6 \cdot h_c) = 6.505 \qquad [kN/m2]$$

$$b_c := \frac{q_c}{d_w^{\ 2}} \cdot (6 \cdot h_1 - 2 \cdot d_w) = 0.929 \qquad [kN/m2]$$



lartesia e vales gjate sizmes

$$R_{fkz} := 2$$

$$d_{wave\_max} := S_{eTcon} \cdot R_{fkz} \cdot \frac{L_r}{2} = 1.16$$

Rezultatet e analizes statike

Ne menyre qe te kapet bashkeveprimi truall-strukture, vepra eshte analizuar ne software-in Sap2000.

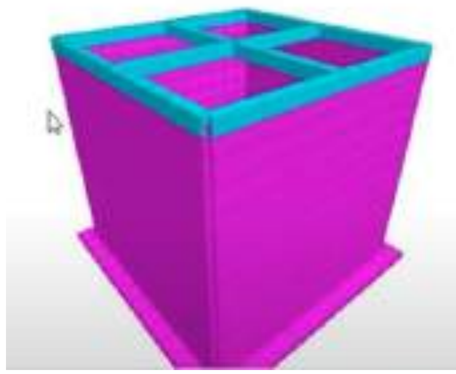


Figure Error! No text of specified style in document.**-12 Pamje 3D e modelit te rezervuarit**

Momente perkulese nga veprimi i presionit te mbushjes anesore (Njesite kN*m)

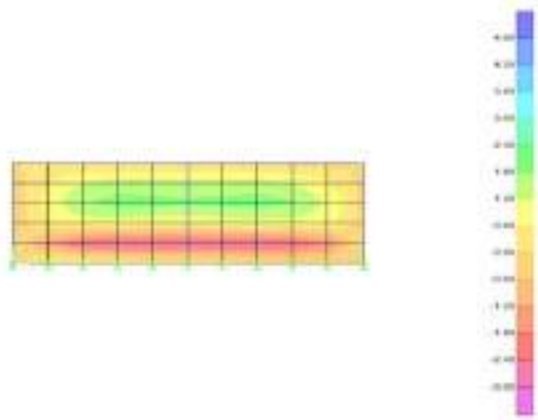


Figure Error! No text of specified style in document.**-13 Momentet perkulese M1-1, ne aksin 1-1 (te modelit)**

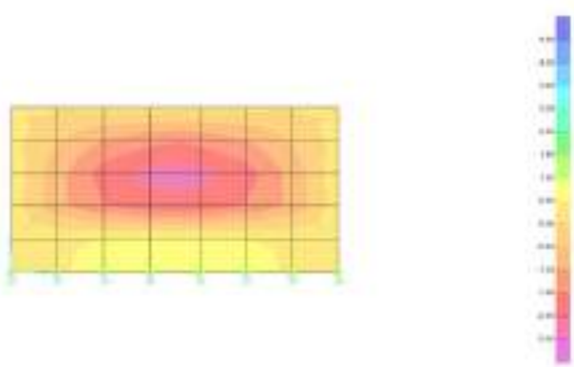


Figure -14 Momentet perkulese M1-1, ne aksin A-A (te modelit)

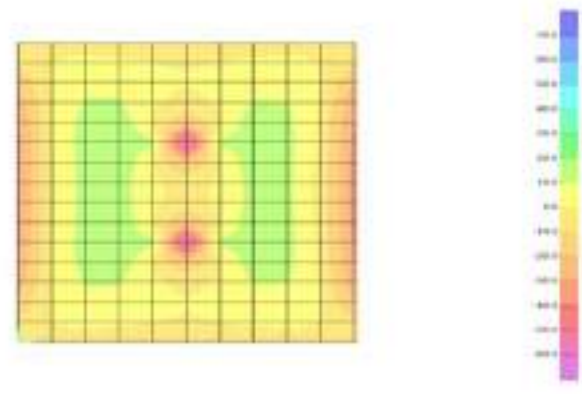


Figure -15 Momentet perkulese M1-1 ne solete

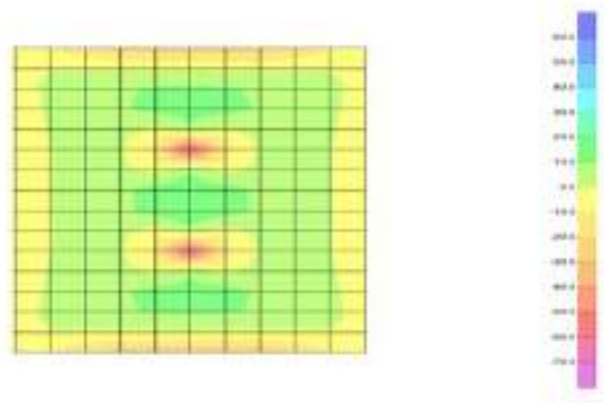


Figure 16 Momentet perkulese M2-2

Momentet pekulese ne pllaken e themelit (njesite kN*m)

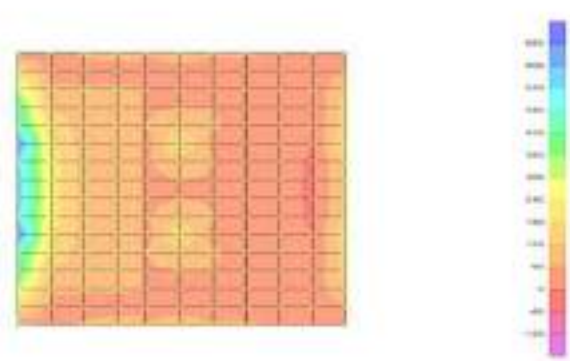


Figure -17 Momentet pekulese M 1-1 sizma xx

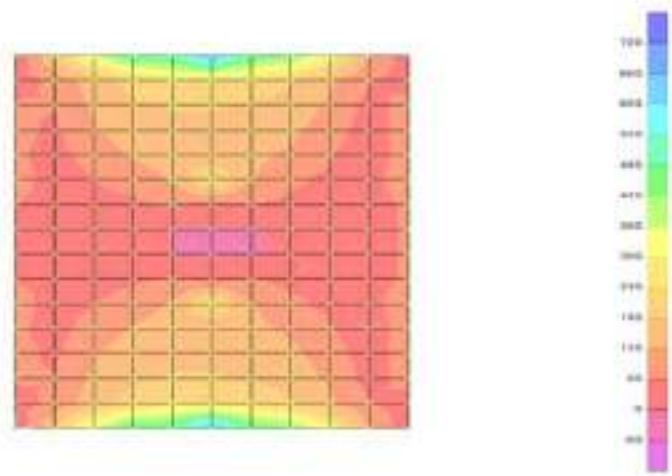


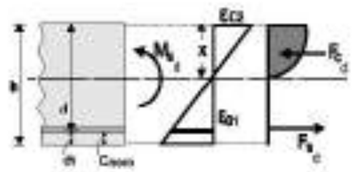
Figure -18 Momentet pekulese M 2-2 sizma y-y

Dimensionimi i seksionit te mureve

16.2.2. **Dimenionimi i seksionit te murit anesor per drejtimin gjatesor**

1. SLAB-002

Cross section of solid slab in bending
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)



h=0.500 m, Med=523.00 kNm
concrete-steel class: C30/37-B500C (EC2 §3)
Environmental class : XC1 (EC2 §4.4.1)
concrete cover : Cnom=40 mm (EC2 §4.4.1)
γc=1.50, γs=1.15 (EC2 Table 2.1N)
fcd=αcc·fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)

1.1. Dimensions and loads

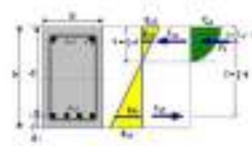
Slab thickness h=0.500 m, Bending moment Med=523.00 kNm (ULS), Med=150.00kNm (SLS)
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=40+16/2=48mm, d=500-48=452mm

1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.3.1)

Med(ULS)=523.00 kNm/m
Dimensioning for bending: Allgower,G.-Avak,R. Bemessungstafeln nach Eurocode 2
fur Rechteck und Plattenbalkenquerschnitte, in: Beton - und Stahlbetonbau 87 (1992)
(σc=fcd[1-(1-εc/εc2)²], fcd=17.00MPa, εc2=0.0020, εcu2=0.0035, fyd=435MPa)
Med=523.00kNm/m, d=452mm, Kd= 1.98 x/d=0.20 εc2/εs1=-3.5/13.7 ks=2.51, **As=29.05cm²/m**
Minimum slab reinforcement, As=0.26bd·fctm/fyk, (As= 6.00cm²/m) (EC2 §9.3.1)
minimum principal reinforcement Ø16/29.5 (6.81cm²/m) , secondary Ø16/34.5 (5.83cm²/m)

slab principal reinforcement Ø16/12.5(20.11cm²/m) , **secondary Ø16/34.5** (5.83cm²/m)

1.2.1. Ultimate moment capacity of cross section (EC2 EN1992-1-1:2004, §6.1)



b=1000mm, h=500mm, d=452mm, As1=3882mm²
εc2=-3.50/oo, εs1=12.67o/oo, As1/b·d=0.00085(0.085%)
x/d=εc2/(εc2+εs1)=3.50/(3.50+12.67)=0.216, x=97.5mm
αr=0.810, ka=0.416, Fc=αr·b·x·fcd=Fs1=1346.40kN, As1=Fs1/fyd=3095mm²/m
z=d-ka·x=(1-ka·εc2/(εc2+εs1))d, z/d=1.0-0.416x0.216=0.910, z=411.3mm
Kd²=1/(0.810·0.216·0.910·17.00)=0.369 mm²/N, Kd=0.607
Bending capacity Mr=b·d²/Kd²=0.000001x1000x452²/0.369=554.00kNm

1.3. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

Med(SLS)=150.00 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.30o/oo
γc=1.00, γs=1.00 (EC2 §2.4.2.4(2))
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq.7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø16/65
Reinforcement ratio ρ=As1/(b·d)=3882/(1000x452)=0.007

1.3.1. State I (uncracked section) (SLS)
Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x10.417)=95216 kNm²
S=As.zs1=(0.001)²x3882x0.202=(0.001)x0.625 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rm=150.000/95216=(0.001)x1.575 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.625/10.417)=(0.001)x0.394(1/m)
Total curvature 1/r=(0.001)x1.575+(0.001)x0.394=(0.001)x1.969(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(10.417/0.250)=120.83 kNm

1.3.2. State II (fully cracked section) (SLS)

ρ=As/(b·d)=0.007, n=ne=21.88, n·ρ=0.153, ξ=0.498, ζ=0.431, x=ξ·d=0.190m
Bending stiffness of fully cracked section, EI=ξ·Es·As·d²=0.498x200x3092x0.451²=62872 kNm²
S=As.zs1=(0.001)²x3092x0.282=(0.001)x0.909 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=150.000/62872=(0.001)x2.386 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.980x(0.909/8.879)=(0.001)x0.510(1/m)
Total curvature 1/r=(0.001)x2.386+(0.001)x0.510=(0.001)x2.896(1/m)
Med=150.00 kNm, εc/εs=0.45/0.62, x=190mm, σs=115 N/mm²

1.3.3. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)

ζ=1-0.50·(Mcr/Med)²=1-0.50x(120.83/150.00)²=0.68 (Eq.7.19)
Final curvature (1/r)=0.68x(0.001x2.896)+(1-0.68)x(0.001x1.969)=(0.001)x2.595(1/m) (Eq.7.18)

1.3.4. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.500m, d=0.452m, x=0.190m, Ø=16mm
Ned=0.00kN, σc=(Ned/bh)=0.0N/mm², σs=125N/mm²
Act=(h-x)·b=(500-190)x1000=309661 mm²
max(h,b1)=1mm, fctm=2.90N/mm², Ac,eff=309661mm², k=0.86, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x0.86x2.90x309661/125=2474mm²/m

1.3.5. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

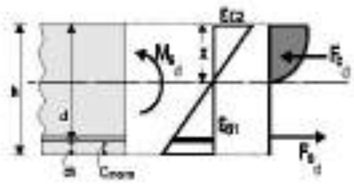
Wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=125N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(500-190)x1000=103117 mm² (§7.3.2.3)
ρeff=As/Ac,eff=3092/103117=0.030
εsm-εcm=[125-0.4x(2.9/0.030)(1+21.88x0.030)]/200=0.30 ε/σs=0.6x125/200=0.37 ε/σs
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=16mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x40.00+0.8x0.5x0.425x16/0.030=226.71 mm
Wk=sr,max·(εsm-εcm)=226.71x0.001x0.37=0.08 mm

Dimenionimi i seksionit te murit anesor per drejtimin gjatesor

1. SLAB-002

Cross section of solid slab in bending
(EC2 EN1992-1-1:2004, EC0 EN1990-1-1:2002,)

h=0.500 m, Med=412.00 kNm
Concrete-Steel class: C30/37-B500C (EC2 §3)
Environmental class : XD1 (EC2 §4.4.1)
Concrete cover : Cnom=40 mm (EC2 §4.4.1)
γc=1.50, γs=1.15 (EC2 table 2.1N)
fcd=αcc·fck/γc=0.85x30/1.50=17.00 MPa (EC2 §3.1.6)
fyd=fyk/γs=500/1.15=435 MPa (EC2 §3.2.7)



1.1. Dimensions and loads

Slab thickness h=0.500 m, Bending moment Med=412.00 kNm (ULS), Med=288.40kNm (SLS)
Effective depth of cross section d=h-d1, d1=Cnom+Ø/2=40+16/2=48mm, d=500-48=452mm

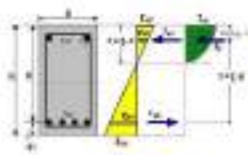
1.2. Ultimate limit state (ULS), design for bending (EC2 EN1992-1-1:2004, §6.1, §9.2.1)

Med(ULS)=412.00 kNm/m
Dimensioning for bending: Allgower,G.-Avak,R. Bemessungstafeln nach Eurocode 2
fur Rechteck und Plattenbalkenquerschnitte, In: Beton - und Stahlbetonbau 87 (1992)
(σc=fcd[1-(1-εc/εc2)²], fcd=17.00MPa, εc2=0.0020, εcu2=0.0035, fyd=435MPa)
Med=412.00kNm/m, d=452mm, Kd= 2.23 x/d=0.16 εc2/εs1=-3.5/18.8 ks=2.46 **As=22.40cm²/m**
Minimum slab reinforcement, As0=0.26bd·fctm/fyk, (As= 6.80cm²/m) (EC2 §9.3.1)
minimum principal reinforcement Ø16/28.5 (6.03cm²/m) , secondary Ø16/44.5 (4.52cm²/m)

Slab principal reinforcement Ø16/13.0 (22.73cm²/m) , **secondary Ø16/44.5** (4.52cm²/m)

1.2.1. Ultimate moment capacity of cross section (EC2 EN1992-1-1:2004, §6.1)

b=1000mm, h=500mm, d=452mm, As1=2233mm²
εc2=-3.50o/oo, εs1=18.89o/oo, As1/b·d=0.0049(0.49%)
x/d=εc2/(εc2+εs1)=3.50/(3.50+18.89)=0.156, x=70.7mm
αr=0.810, ka=0.416, Fc=αr·b·x·fcd=Fs1=972.37kN, As1=Fs1/fyd=2235mm²/m
z=d-ka·x=(1-ka·εc2/(εc2+εs1))d, z/d=1.0-0.416x0.156=0.935, z=422.6mm
Kd²=1/(0.810·0.156·0.935·17.00)=0.497 m²/N, Kd=0.705
bending capacity Mr=b·d²/Kd²=0.000001x1000x452²/0.497=411.00kNm



1.3. Serviceability limit state (SLS) (EC2 EN1992-1-1:2004, §7)

Med(SLS)=288.40 kNm/m
Final creep coefficient φ(∞,to)=2.50 (EC2 §3.1.4, Annex B)
Total shrinkage strain εcs=-0.30o/oo
γc=1.00, γs=1.00 (EC2 §2.4.2(4.2))
Modulus of elasticity of concrete Ecm=32GPa, Ec,eff=32/(1+2.50)=9.14GPa=9140MPa (EC2 Eq.7.20)
Modulus of elasticity of steel Es=200GPa=200000MPa
Modular ratio αe=Es/Ec=200/32.00=6.25, effective αe=Es/Ec,eff=200/9.14=21.88
Tension reinforcement: Ø16/90
Reinforcement ratio ρ=As1/(b·d)=2233/(1000x452)=0.005

1.3.1. State I (uncracked section) (SLS)
Bending stiffness of uncracked section, EI=(200/21.88)x(0.001x10.417)=95216 kNm²
S=As.zs1=(0.001)²x2233x0.202=(0.001)x0.451 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=288.400/95216=(0.001)x3.029 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.451/10.417)=(0.001)x0.284(1/m)
Total curvature 1/r=(0.001)x3.029+(0.001)x0.284=(0.001)x3.313(1/m)
Cracking moment, Mcr=fctm·(I/y2)=2.9x(10.417/0.250)=120.83 kNm

1.3.2. State II (fully cracked section) (SLS)

ρ=As/(b·d)=0.005, n=αe=21.88, n·ρ=0.109, ζ=0.551, α=0.371, x=α·d=0.168m
Bending stiffness of fully cracked section, EI=ζ·Es·As·d²=0.551x200x2233x0.452²=50296 kNm²
S=As.zs1=(0.001)³x2233x0.284=(0.001)x0.635 m³ (EC2 Eq.7.21)
Curvature due to moment 1/rM=288.400/50296=(0.001)x5.734 (1/m)
Curvature due to shrinkage 1/rcs=(0.001x0.30)x21.880x(0.635/5.503)=(0.001)x0.400(1/m)
Total curvature 1/r=(0.001)x5.734+(0.001)x0.400=(0.001)x6.134(1/m)
Med=288.40 kNm, rc/rs=0.96/1.63, x=168mm, σs=326 N/mm²

1.3.3. Checking deflections by calculation (SLS) (EN1992-1-1, §7.4.3)

ζ=1-0.50·(Mcr/Med)²=1-0.50x(120.83/288.40)²=0.91 (Eq.7.19)
Final curvature (1/r)=0.91x(0.001x6.134)+(1-0.91)x(0.001x3.313)=(0.001)x5.887(1/m) (Eq.7.18)

1.3.4. Minimum reinforcement areas (SLS) (EC2 EN1992-1-1:2004, §7.3.2)

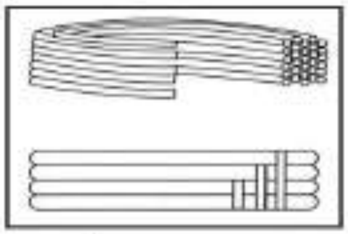
Minimum reinforcement areas As,min=kc·k·fct,eff·Act/σs (EC2 Eq.7.1)
b=1.000m, beff=1.000m, h=0.500m, d=0.452m, x=0.168m, Ø=16mm
Ned=0.000kN, σc=(Ned/bh)=0.0N/mm², σs=326N/mm²
Act=(h-x)·b=(500-168)x1000=332315 mm²
max(h,b1)=1mm, fctm=2.90N/mm², Ac,eff=332315mm², k=0.86, kc=0.40, k1=1.50
Minimum reinforcement, As,min=0.40x0.96x2.90x332315/326=1017mm²/m

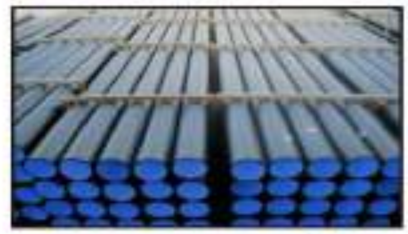
1.3.5. Calculation of crack width (SLS) (EC2 EN1992-1-1:2004, §7.3.3)

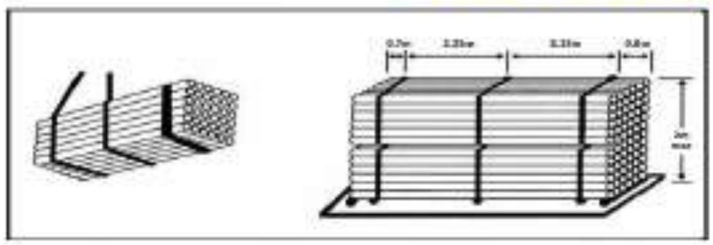
wk=sr,max·(εsm-εcm) (EC2 Eq.7.8)
εsm-εcm=[σs-kt·(fct,eff/ρeff)(1+αe·ρeff)]/Es >=0.6 σs/Es (EC2 Eq.7.9)
σs=326N/mm², short term loading: αe=6.25, kt=0.6, long term loading: αe=21.88, kt=0.4
Aceff=0.333(h-x)b=0.333x(500-168)x1000=110661 mm² (§7.3.2.3)
ρeff=As/Ac,eff=2233/110661=0.020
εsm-εcm=[326-0.4x(2.9/0.020)(1+21.88x0.020)]/200=1.22 o/oo>=0.6x326/200=0.98 o/oo
sr,max=k3·Cnom+k1·k2·k4·Ø/ ρeff (EC2 Eq.7.11)
Ø=16mm, k1=0.8, k2=(ε1+ε2)/2ε1=0.5, k3=3.4, k4=0.425
sr,max=3.4x40.00+0.8x0.5x0.425x16/0.020=270.80 mm
wk=sr,max·(εsm-εcm)=270.80x0.001x1.22=0.33 mm

9. TUBACIONET DHE RAKORDERITE E PUSETAVE

Per ndertimin e rrjeteve te ujesjellesave te fshatrave te Nj.A SHeze do te perdren metoda e lidhjes me elektrofuzion me tubo PE100 PN16,PN10 dhe PN 20 me diameter nga Ø 125 mm per ndertimin e linjave te jashtme deri Ø 40 mm per linjat e furnizimit me uje te grup shtepive.







Karakteristikat kryesore te tubove jane:
Sistem Cilësie i Certifikuar– UNI EN ISO 9001:14001.
Karakteristika fizike dhe Mekanike si në vijim:
Elasticitet/aftësi ripërtërirëse (Charpy) -30°C: 40 kJ/m2
Elasticitet/aftësi ripërtërirëse 23°C: 25 kJ/m2
Elasticitet/aftësi ripërtërirëse -30°C: 2.5 kJ/m2
Elasticitet/aftësi ripërtërirëse (Izod) -30°C: 28 kJ/m2
Elasticitet/aftësi ripërtërirëse Gërvishtje 23°C: 23 kJ/m2
Elasticitet/aftësi ripërtërirëse Gërvishtje -30°C: 2.5 kJ/m2
Testi produktivitetit: 27 N/mm2
Elasticiteti produktivitetit: 11%
Zgjatime thyerëse: >800%
Module tërheqje E: 900 N/mm2
Produktivitet elasticiteti në tension tangent: 450 N/mm2
Shtypje përthyerrëse 3.5%: 24 N/mm2
Test ashpërsie Brinell: 49 N/mm2
Stabilitet nxehje Dimensionale °C: 75 °C
Rezistencë sipërfaqeje: > 1013 Ω
Densiteti i massës: > 1016 Ωcm
Konstant relative dielektrik: 2.3
Ngurtësi Dielektrike: 75 kV/mm
Konductivitet Termal në 20°C: 0.22 W/mK
Faktor Termal ekspansioni: 0.15 mm/m°C
Ngrohje Specifike : 2.0 Kj/KgK

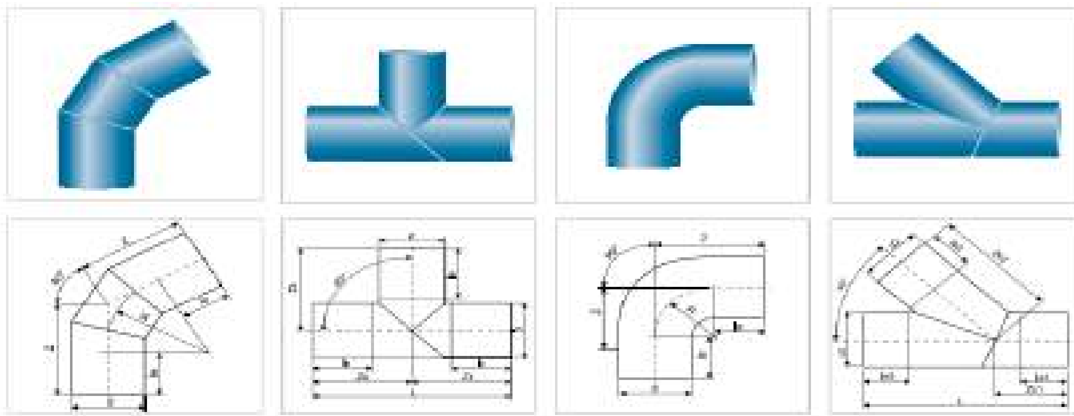
Kritere të përgjithshme për skicimin e tubacione/ve :

Dizajnimi, instalimi, punëtoria, inspektimi dhe testimi i rrjeti i tubacioneve do të kryhet në përputhje me kodet e dizenjimit dhe specifikimet të miratuara .Të gjitha tubacionet nuk duhet të jenë me vrima , të pastra dhe të lëmuara kudo, nga ana tregtare të drejta dhe të kalibruara, pa korrozion dhe defekte të tjera prodhimi në sipërfaqe .

Prodhimi i tyre behet me rrota 100 ml per diametra 63 – 90 mm, 50 ml per diametra 110 – 125 mm dhe 12 ml per diametra mbi 125 mm. Bashkimet do te behen me elektrofusion ose buttfusion.

Tubat vendosen mbi nje shtrese rere 10 cm dhe mbulohen per te ruajtur nga goditjet me rere deri 10 cm mbi pjesen e siperme te diametrit te tubit..

Armaturat (saracineska , valvola etj. montohen me flanxha metalike te cilat lidhen me qafa speciale me krah te gjate dhe krah te shkurter.



Te gjtha keto bashkime behen jashte kanalit dhe mbasi garantohet cilesia shtrihet me kujdes pa u mbuluar.

Mbulimi behet mbas kryerjes se proves hidraulike.

Ne vendet e kryqezimit jane parashikuar puseta betoni (shih projektin) me kapak gize.

Pusetat jane parashikuar te kene dimensione te mjaftueshme per te manovruar gjate avarive, ose zevendesimit te pjeseve te difektuara .

Gjithashtu kujdes duhet treguar ne zonat ujembajtese. Ne pusetat e shkarkimit vendoset e tub per largimin e ujrave duke e derdhur ate ne vendkullimi te sigurt.

Para hapjes se kanalit do te verifikohen te gjitha pikat e kontaktit per te shmangur avarite e mundeshme sidomos kabllot elektrike, telefonike etj

Te respektohen distancat midis tyre kuotat e kryqezimeve etj.

Per:
ARABEL – STUDIO Sh.p.k
Adm.Ana Nishku