

KAEDI YA KAGÔ YA GUIDE TO THATCHING IN SOUTH AFRICA



THATCHERS ASSOCIATION
OF SOUTH AFRICA

**KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA
BORWA – 2016 Kgatisô 1**

Lokwalo lo, lo tshwanetse Borameagô, Borameagô ba kagô ya borurêlô ba bojang, baagiteke, batsayatshwetso, baenjênerê le maloko a ditifikeiti.

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**TUMELANÔ TSOTLHE
KE TSA MOKWADI**

Kaedi e ya Kagô ya Borurêlô jwa Bojang mo Aforika Borwa ke phasalatsô ya mokgatlhô wa Borurêlô jwa Bojang mo Aforika Borwa mme ga se tihaloso ka botlalo. Tihalosô ka botlalo ya Borurêlô jwa Bojang mo Aforika Borwa ke SANS 10407-2015 Kgatisô ya 2

Kaedi e, ke thoto ya Mokgatlhô wa Aforika Borwa wa Borulêlô jwa Bojang mo Aforika Borwa mme ga go karolo epe ya phasalatsô e, e e tla tloswang kgotsa ya fetolwa kgotsa ya okediwa kwa ntle ga tshweetso ya bontsi jwa komiti ya khuduthamaga ya TASA.

KETAPELE

Mokgathô wa Borurêlô jwa Bojang mo Aforika Borwa (TASA) o tihabolotse lokwalô le go fitlhêlang ditlhokegô tse kgolo tsa mesupatsela tota wa tsepamo le tlamêlô ya marurêlô a bojang le boleng go ya ka ditlhokegô tsa kemo tsa go farologana tsa Setšhaba sa Aforika Borwa.

Go ya ka tlhōkegô ya minimamô ya dikemo. Tiriso ya kaedi e, e tthalosa matereale, ditirêgô le mekgwa ya tekô e etla dirisiwang go ya ditlhokegô tseô.

Lokwalô le, le akgola melao ya kagô ya meagô ya Setšhaba gape le SANS 10407 – 2015 Kgatisô ya 2. Re tla solofela dikemo tse gore di nne le pateletsô mo go bokamoso jo bo gaufi. Kaedi e, e tla thusa intasetari go baakanya se.

Go botlhokwa tota, lokwalo le, gape le tla tlhama temôgô ya boikanyô mo intasetari. Badirisi ba bofelô le Barulêdi ba tla kgona go e dirisa jaaka lokwalô lwa tshupetsô le le tshegetsang Dikemo tsa Setšhaba.

Go nnile le tlhokegô e e feteletseng ya batho ba batšha mo intasetari gape le phetolô ya dipharologanô tsa seretala e na le tiragalô e kgolo ya boleng jwa kumo ya bofelô.

Lokwalo le, le tshwanetse barulêdi, borakonteraka, batsayatshweetso ba baagiteke, baenjênêre le makôkô a ditefikeiti. TASA e tshwanetse go akgolêlwa boitekô le phêtsô ya lokwalo, se se tla abela intasetari ya boitekanêlô le boikanyo ka go lekanyetsa tema ya motshamekô.

Rona mo SATAS re motlotlo go nna tsalana le TASA ka setifikeiti tsa maloko a bona. Rona jaaka mokgathô wa go tlhomamisa ka ditifikeiti go botlhokwa go nna le tolamo le pheletso ka go tlhomamisa ga ditifikeiti le tshekatshekô mme mela ya kaedi e tla re thusa gape ka go dira ka mokgwa tolamo le go lekana.

Re akgola le go lebogela botlhe ba ba ntshitseng seabe go dira lokwalo le, le kaelo e kgolo e e tlišang pharologano mo intasetari.

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KAMOGÊLÔ

Mokgathô wa Borulêlô jwa Bojang mo Aforika Borwa o rata go leboga SAWPA (*the South African Wood Preservers Association/Mokgathô wa Baboloki ba Dikgong mo Aforika Borwa*) go lebogela letlole le tšhelete tsa go baakanya kaedi e.



CHOOSE THE CORRECT HAZARD (H) CLASS:

- H2 – **Low Hazard:** Inside above ground
- H3 – **Moderate Hazard:** Outside above ground
- H4 – **High Hazard:** Outside in ground
- H5 – **High Hazard:** Outside in contact with heavy wet soil or in fresh water
- H6 – **High Hazard:** Prolonged immersion in sea water



FOR MORE INFORMATION ABOUT SAWPA MEMBERS AND HOW TO CONTACT THEM. CONTACT:

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DITENG

	Palo ya Tsebe
DITHANOLÔ	10
TIREGÔ YA POROJEKE	12
Ditlhokegô	12
Baagiteke le Baenjênêrê	12
Borakonteraka ba Borurêlô jwa Bojang	13
Dipotso tse di thusang fa go thapiwa Rrakonteraka	14
Dipotso tse khamphani ya Inšorense e ka di botsang	15
Tiregô ya porojeke ya katlegô	16
Maikarabêlô a Rrakonteraka	17
Maikarabêlô a Modirelwa	17
DITHALWA TSA BORULÊLÔ	18
MATERIALE A BORURÊLÔ	21
Borurêlô jwa Bojang le Matlhaka ka kakaretsô	21
Totobetsô ya go tsengwa ga borurêlô jwa bojang	22
Totobetsô ya Matlhaka a Kapa	25
Totobetsô ya matlhaka a ka mo metsing	26
Polokêlô ya Borulêlô jwa bojang mo setsheng	26
Phepafatsô & Phuthêlô	28
SEBOPEGÔ SA BORULÊLÔ	29
Go baya sebopêgô	29
Ditlhokegô tsa dikota	32
Go tlhomela kôta e fa gare e e rweleng marurêlô	32
Dipilara tse di tsepameng	34
Dikôta tse kgolo tsa go rwala marurêlô	34
Katolosô ya tlhameso	36
Katolosô ya sefata	36
Katolosô ya Mosipori le Boemô	37
Dikgolaganô tsa Mosipori wa Tshekeletsa	37

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Phaposô	39
Ditshegetsi tsa Phefô	40
Dikotana le Lobalêlô	41
Katolosô ya Lobalêlô	41
Mogorogoro	42
Matlhakore	44
Melelwane	44
Dintshamosi	45
Diphaepe tsa tshipi tsa foluêla	46
Dintshamosi tsa bojang jwa go tlhatlhagana	49
Mamênô a bojang jo bo tswalêlang diphatlha	49
GO TSENGWA GA BORULÊLÔ JWA BOJANG	52
Bôalô jwa go nusetswa	52
Pofelêlô ya borulêlô jwa bojang	54
Katolosô ya pofelêlô	55
Kgagamalô ya pofelêlô ya tshipi	55
Kgagamalô ya pofelêlô ka sokasoka	56
Tshunuka	57
Borurêlô jwa bojang godimo ga ditshunuka	57
Bokima jwa boalo jwa borurêlô jwa bojang	58
Go ala borurêlô jwa bojang	59
MEKWATLA YA NTLO	60
Ka kakaretso	60
Mekwatla ya ntlo ya bojang	62
Mekwatla ya ntlo ya galase ya faêbara	62
Mekwatla ya ntlo ya motlhaba le samêntê	63
GO TSENYA KA KAKARÊTSO	66
Go tsenya tsekedima	66
Go tsenya sefô e nnye	66
Go tsenya lefesetere la kwa godimo	67

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Mekoro ya lebôkôsô	67
Sekamarulêlô a bojang	68
Disileng tsa marulêlô a bojang	68
Go tsenya kisara	69
Setsha sa polokêgô	70
TLHOKOMELÔ YA BORULÊLÔ JWA	
BOJANG	71
PAAKANYÔ/TLHOMAMISÔ YA BORULÊLÔ	
JWA BOJANG	74
PABALESEGO YA MOLELÔ	76
Pabalesego ya bokgakala	76
Bodiredi	77
Go dirisa diphetisi	77
Thulaganyô ya Tshireletso ya Legadima (<i>LPS</i>)	78
Kitlanô mo fatshe ya bebenya ya Legadima	79
Dikemiso-thanya	87
Dithulaganyô tsa Sekolobisa	88
Kobô ya molelô	88
BOLENGDIPALO JWA ENEJI	89
Minimamo wa palogotlhe ya bolengdipalo-R jwa Dikopanyô	
tša Marulêlô	90
Dikgaolo tša tlêlamêtê mo Aforika Borwa	92
BOKHUTLÔ	94
KAMOGELO LE DIRÊFÊRÊNSE	95
BOITATOLÔ	97

DITHANOLÔ

Ka lobaka lwa boikaêlêlô jwa keadi e, go nêelwa dithanolô tse di latelang.

Bokhutlo Moragô

botlase, bokhutlo jwa kutu ya borulêlô jwa bojang

Motho wa bokgoni

Mongwe yo a nang le katiso ya go lekana, tirafatsô, kitso le dithutêgô tsa go thusa ka botlalô ka tlhokegô e e rileng.

Phapogô

Pharologanô magareng ga selekanyô tôta (ka tekanyô) le boêmô gape le selekanyô se se totobetseng kgotsa boêmo.

Go apesa

Tirô ya go konyakonya dikhutlhô-morago tsa borulêlô jwa bojang kgotsa borulêlô jwa bojang jwa lotlhaka go ya kwa godimo ka *legatê* go kuma bogodimo jwa go siama jwa go thulama.

Lobalêlô

Leloko la kota ya sedikadike se se nnye, ya tthamaganô ka go bapa le molêlwane wa lekhubu, mo ditlhômêso ka sekhutlô sa moja, le godimo ka tthamaganô ya borulêlô jwa bojang

Phiphitelêla

Godimo ga borulêlô jwa bojang
Bôalô jwa bobêdi godimo ga bôalô jwa tshimologô

Bôalô jwa go nusetswa

Bôalô jaanong jaana kwa godimo ga dikotana tsa borulêlô le dilobalêlô, fa e leng gore bokwatlase ka mo phaposing bo bônalêsêga gantsi

Lebôta la go tshegetsa

Lebôta la go bopêga la modirô jaaka lebôta la go tshola morwalo o o tshwanelang ke go tshegetsa borulêlô jwa bojang

Tshunuka

Thupa e e bapang le lobalêlô ka mo gare ga lefutô la bôalô jwa borulêlô mme e bofa materiale mo lobalêlông go sirelêtsa borulêlô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Tsheka-tshekô e e rašenala

Tsheka-tshekô go ya ka motho wa bokgoni wa go lekana ka tirafatsô ya tharabololô go ya ka ditlhokegô le kakaretso ya tsamaiso ya seakanyô, palêlô le go naganêla ditaolô tsa go sekaseka tse di dumêlêlwang, go ya ka kgobokanyô ya diphokotsô go tswa mo tshedimosetsô e e leng teng, dipatlisisô le datara, tekô e e tshwanetseng le tirafatsô ya tirêlô

Sethalwa sa rašenala (Boenjenêrê jwa molelô)

Sethalwa se se dirilweng ke motho yo a rejesetarileng go ya ka melawana ya Boenjenêrê jwa Boithutelo, 2000 (Tirô ya No. 46, 2000), jaaka rraenjenêrê wa boithutelô kgotsa rratêkênolojisi wa boenjenêre jwa boithutelô, mme e tlwaetse go lemogiwa ka go nna le tirafalô e e tlhokegang le katiso ka go tsaya karolô mo ditshekatshekông tsa rašenala kgotsa dithalwa tsa rašenala mo lobakeng lwa Boenjenêrê jwa molelô.

ÊLATLHOKÔ: Se ke thanolô e e tlwaelegileng, go dirisiwa fa go sena thanolô e ngwe e e ka neelwang, kgotsa fa go sena direferênsê tsa go tlhêlwa ka dikemo tse dingwe. Dikarolo tse dingwe tsa SANS 10400 di na le dithanolô tsa tlhagô e e rileng e e maleba le dithupiso tsa bone.

TSAMAISO YA POROJEKE

DITLHOKEGÔ

Kagô ya marulêlô a bojang le dipopêgô ke kgwêbô e e tlišaolegileng. Kwa ntle ga gore bokima kgotsa bonnye ba sebopêgo bo ntse jaang. Melawana e kaya ka tlišomamo gore sethalo le thulaganyô tsa gore sebopêgô se tšile go lebega jang di tšhwanetse go thala ke moagiteke kgotsa moenjênêrê wa dipopêgô. Sethalo se tšhwanetse go dumêla melawana ya kagô ya Mmasepala le Setšhaba (SANS 10400-L, SANS 10400-T le SANS 10407 (Totobetsô ya borurêlô jwa bojang)).

BAAGITEKE LE BAENJÊNÊRÊ

Moagiteke o tla neela mmasepala dithulaganyô jaaka fela e le motho yo a nonofileng mme a rejêsitari leng le SACAP, *Khansele ya Borutegi ya Baagiteke ba Aforika Borwa*, a ka kgona go neela dithulaganyô. Mong wa legae yo a rejêsitari leng go tla tlišokega gore a saene diforomo tse di rileng tsa mmasepala go neela moagiteke tetla ya go neela dithulaganyô mo boemong jwa bone. Khôpi nngwe le nngwe e tšhwanetse go neelwa le *thaetlêlê ya molawana wa dithoto* e tlišokega gape jaaka ditlhokegô tsa thêo tsa go neela

Thulaganyô e tšhwanetse ke go dumelwa ke Mmasepala le moenjênêrê wa dipopêgô (motho wa bokgoni), o tla seka seka gape go netefatsa gore a e tlišômamisa dikemo tsotlhe le melawana ya phetsô. Moenjênêrê o tla tšhwanela ke go ntsha setifikeiti sa A19 sa go dumêlana le dikemo le melawana. Kwa ntle ga setifikeiti seo, mmasepala o ka se kgone go saenela thenolo ya popêgô epê. Motlhatlhoobi wa dikagô o tla ntsha setifikeiti sa Phetso se se tšwang kwa Mmasepala kwa bofêlêlông fa ditlhokegô tsotlhe di kopane. Boago bo bo ka letlêlêlwa go rekisiwa kgotsa go rekiwa kwa ntle ga setifikeiti se.

Fa o dirisa motho yo a nang le bokgoni gape go go letlêlêla gore o nne le popêgô e e thadilweng ka kakanyô e e akaretsang melawana ya molelô, se se thusa mong wa legae fa e tla mo inšorêense. Fa ditsela tsa tšharelêtsô ya molelô di beiwa sentle, dikhamphani tsa inšorêense di batlana le di phorêmeyamo tsa kwa tlase tse di thusang mong, e seng fela ka ditšhelêtê gape le ka go neela kagiso mo kakanyông. Motho o a na leng bokgoni, o a rêjêsitari leng go ya ka melawana ya Tiro ya Boithutelô jwa Boenjênêrê, 2000 (Tiro ya No.46, 2000), jaaka rraenjênêrê wa boithutelô kgotsa rratêkênolojisi wa boenjênêrê jwa boithutelo, mme e na le tirafalô e e tlišokegang mo lobakeng lwa Boenjênêrê jwa molelô.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Gape e tla neela Mmasepala sethalo se se Rašenale se se kopiwang gantsintsi ke Lefapha la molelô mo dimmasepala, go bontsha dipalelo tsa mefutafuta tsa go bontsha gore borulêlô jwa bojang bo ka se ba nne le tshupamolato go dikago tsa baagisani.

Tirafatsô ya pêrêko e e bosula, boleng jwa materiale o o dirisitsweng le bo se teng ba dithulaganyô tsa go amogelêsêga gape le kwa ntle ga go neêla le ditifikeiti tse di tlhokegang, sê se padimoga leina la intasetari. Go tloga ka nako ya ditshimololô ya TASA ka 1 Janaware 2006, mabaka a tona a mabedi go tlhôma katlêgô kgotsa tlhaêlô a lesomô la borulêlô jwa bojang, a rotoga, go twe:

1. Tlhokomelo ya setsha ka motho yo a naleng kitso tota
2. Boleng jwa materiale le pêrêko e ntle

Marulêlô a bojang jo bo agilweng kwa ntle ga dithulaganyô tsa go amologelêsêga gape go sena tlhokomelo ya raenjenêrê wa bokgoni, a bakile go opiwa ga ditlhôgo tsa badirelwa le TASA. Perêrêkô e bosula, mathata a kago le dimateriale a môtlana tse di dirisiwang di tliša bopaki ka botlalô jo bo ka dirisiwa ke badirelwa go suwa rakonteraka. Borulêlô jwa bojang mo Aforika Borwa bo tshwanetse ke go agiwa go ya ka ditlhêgô pêrêko tse di rileng tsa SANS 10407 – 2015 Kgatiso 2 (Kaô ya Borulêlô jwa Bojang) le SANS 10400 (Melawana ya Boagô ya Setšhaba ka referênsê ya kgaolo 'L')

Kgatlhêgô e molemô ya badirelwa ke go netefatsa gore kumako ya ditlhokegô tsotlhe ya arabiwa gape le go botsa fa moagi wa borulêlô jwa bojang a rêjêsitare le leloko la TASA. Ka go tlhôma porojekê e ya Borulêlô jwa Bojang go netefatsa ditlamôrago ka katlêgô le tsamaiso e senang mathata.

BORAKONTERAKA BA BORULÊLÔ JWA BOJANG

Go tlhopa ga rakonteraka wa borulêlô jwa bojang ke kgatô e botlhokwa tota mo tsamaisong. Go botlhokwa go netefatsa gore rakonteraka o rêjêtarile le TASA, *Thatchers Association of South Africa*. Baagi botlhe ba go rêjêsitara le TASA ba Borulêlô jwa Bojang ba tshwanetse go sala ditlhôkego le melawana ya boleng jwa borulêlô jwa bojang, morago. Jaaka go builwe, intasetari ya borulêlô jwa bojang ke setsha se se kgethegileng mme go tlhopho rakonteraka wa go tlhotlwa tota e ka ba e le phosô ya mong e turang tota.

Go na le dithêo tse di rileng tsa borulêlô jwa bojang tse di tshwanetse go salwa morago. Go amogela tsamao ya botshelo jwa borulêlô, go tshwanetse go salwa morago melaô e rileng e e seng mo pepênêneng go ba e seng batseneledi, jaaka

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

dikhutlô tsa borulêlô, boemo le sekhutlô sa mesele ya metsi e e leng maleba go dipopêgô dingwe tsa togamaano ya ntlha. Polane ya bodilo le tsholetsô ya boagô di tlhotlholetsa sethalo sa dipopêgo tsa borulêlô, go le gantsi di ama le tlhomamo ya dipopêgô tsa borulêlô, bogolo tota fa go na le mekwatla ya bogodimo le dikgatlanô tsa borulêlô. Dikgatlanô tse, ga di letlêlêle go bewa ga ditshegetsi tse di nonofileng, gantsi ga gona mabota a tshegetsô go thiba tlhokô ya tshegetsi e e kgonang.

Ka mogopolô wa tse di kwadilweng mo godimo, moagiteke, mo kगतong ya thulaganyô le go thala, o tshwanetse go rerisana le mongwe o mogolo wa intasetari go baakanya le go fetola sethalo le go netefatsa tlhomamo tota ya popêgô mme le go godisa mokoro ka lebaka la go baakangwa ga dithulamo tsa borulêlô le boemo ba mesele ya metsi ka kakaretso ya sethal sotlhe sa borulêlô.

Go sekaseka sebopêgô sa borulêlô jwa bojang raenjênêre o tla tlhoka sethalo sa sebopêgô sa borulêlô jwa tshithinyo ka go balela saese ya dipala le dipalo le molagare wa dipakêla tse di tlhokegang mo bokopanyô jwa mefutafuta.

Gantsi mo malatsing a, marulêlô a bojang a agiwa kwa ntle ga methalo ya dipopêgô le tshekatsheko. Ka jalo morago ga se, go thata, gape go a tura go e fetola, ka nako engwe gago kgonagale. Ka methalo ya botlalo moagiteke a ka kgona go athola diasetetiki tsa sebopêgô gape le go tshentsha dintlha ka kगतlanô le raenjênêre go thusa modirelwa.

DIPOTSÔ TSE DI THUSANG FA GO THAPIWA **RAKONTERAKA**

A Rakonteraka o:

1. itsanye le SANS 10407 – 2015 Kgatisô 2 E Totobetseng
2. itsanye le Melawana ya Kago ya Bosetšhaba
3. Ke leloko la TASA (Mokgatlhô wa Borurêlô jwa Bojang mo Aforika Borwa / *Thatchers Association of South Africa*)
4. Nomoro ya gagwe ya maloko ke efe
5. A rakonteraka o rejêsitatile VAT
6. Feme ya gawe e ntse e dira sebaka se se kana kang
7. O na le direfêrêense go tswa mo:
 - a. Diagiteke
 - b. Boranenjênêre
 - c. Badirelwa
8. Bofelêlô jwa Diporojeke, Potefoliyo
9. O na le dithulaganyetso tsa go tlhokega le badiri ba ba katisitsweng
10. Go tla tlisiwa konteraka e kwadilweng ya tumalanô ya batsayakarolô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

11. Go dumelana le gore ke mang yo o tla nnang le boikarabelô go babalêla methalô ya sebopêgo se se tlokegang le dithulaganyô tsa kagoô le go siamisa thebolo ya baitseanape ba maleba.
12. Rulaganyetsa ditlathobo tse di tlokegang le go amogela ditifikeiti tsa kgololo le ditifikeiti tsa boenjênêre tse di tlokegang.
13. Ke mang yo a tla nnang le boikarabelô ba inšorensense ka nako ya kagô
14. A rankonteraka o neela tiisetso tsa tirô le ditiretala.

DIPOTSÔ TSE DITLAMO TSA INŠORENSENSE DI KA DI BOTSANG

Dipotô tse di tlwaelegileng tse ditlamo tsa Inšorensense di ka di botsang:

- Leina la khamphani ya gago ya borulêlô jwa bojang ke eng?
- Boemo jwa jaanong jwa borulêlô ke eng?
- A boagô jo bo tsentswe gape bothale?
- Kagô ya mabota (setena & seretse, kota)?
- A khitšhi e na le sileng ya konkereiti?
- A kagô e na le dintshamosi?
- Fa o re ENG, e gola go feta mola wa borulêlô?
- O dirisa melemô e e bulegileng, e tukisa ke dituki tsa komota (g.k. kota)?
- A dintshamosi di tsentswe dikemiso-thanya?
- A kagô e e na le diphetisi tsa legadima tse di amogelesegang?
- A borulêlô jwa bojang bo abaletswe ka thulaganyô ya go tima molelô?
- A kagô e e tshirêlêditse ke dithulaganyô tsa sekolobisa?
- Go tsentswe lethompo la go tima molelô mo lefelong?
- O na le Setifikeiti sa Tumelanô sa motswedi wa bokgoni kgotsa makwalotshupô; kgotsa ka thefosano; Setifikeiti sa Boenjênêre?
- Ke eng bookgakala ba gago le seteišene sa molelô?

TSAMAISO YA POROJEKE YA KATLEGO

1. Methalo ya sebopêgô kgotsa polane e e thadilweng ke moagiteke / raenjênêre wa dipopêgô le go abelela amogelesega ga baitseanape ba ba maleba.

(Dimmasepala di ka se neele setifikeiti sa tirô kwa ntle ga go amogelesega ga dithulaganyô tsa kagô mme le tshutiso ya boagô e ka se diragale fa go sena ditifikeiti.)

- 1.1 Fa o khoutela porojeke, rakonteraka o tshwanetse go ba le kitso ka botlalô ya gore ke eng se se solofediwang le ditotobetsô tse di neelwang gore a kgone go balela bokanakang.
- 1.2 Rakonteraka o tshwanetse go netefatsa fa methalo kgotsa dithalo di lebane le melawana ya borulêlô jwa bojang.
- 1.3 Rakonteraka o tshwanetse go sala morago ditlhokego tsotlhe/ ditotobetsô tse di tiholang ke raenjênêre wa sebopegô kgotsa moagiteke gore setifikeiti sa bofelêlô sa go amogelesega se ka amogelwa go tswa go bone fa porojeke e fela.

2. Totobetsô

Kagô e tshwanetse go sala morago ditlhokegô tsa SANS10407 – 2015 Kgatiso ya 2

3. Konteraka e e kwadilweng

Konteraka e e kwadilweng e amogelesegileng mme e saenilwe ke batsayakarolo botlhe, ke se se tlhokegang pele porojeke e ka simolola.

4. Dingongorego le Ditlhaeletsano

- 4.1 Go rotloetsa ga tlhaeletsano ya go boaboêla e e agang magare ga modirelwa le rakonteraka.
- 4.2 Dikwalô tse di siameng, tse di feletseng tsa go itsheka ka go tlhokomela dikopô le diphetogô tse di botlhokwa tota mo porojekeng e, go thiboga go se tlhaloganye.

MAIKARABÊLÔ A RAKONTERAKA

1. Tiralô le boaboêla jwa botsô ka nakô ya botswêlêlo
2. Badirelwa ba tshwanetse go itse ka botlalô tiro e e dirang gape le ditotobetsô le ditlhokego tsa molao.
3. Badirelwa ba tshwanetse go abelwa lokwalô lwa dintlha le le lemosang tlhwatlhwa gape le ditlhokegô tsa go duela. Se se akaretsa go lekanyetsa le dikhoutu tse di kwadileng.
4. Badirelwa ba tshwanetse go abelwa go lekanyetsa ga dinako mmogo le go lekanyetsa ga letlha la phêtsô. Go tshwanetse go nne le tshupadinakô e feleletseng.
5. Badirelwa ba tshwanetse go gakololwa fa go na le diphetogô tse di amang letlha la phetsô mme ba kgone go baakanya tshupadinako sentle.
6. Rakontereka o tshwanetse go dumela maikarabêlô a gagwe a ditirô tsa badiri/ka kakaretsô ya bathusi-rakonteraka, bagakolodi kgotsa baemedi ba ba thapilweng ke ena.

MIKARABÊLÔ A MODIRELWA

1. Modirelwa o tla tlhoka go amogelesega gotlhe ke batseanape ba ba maleba go thiboga ditiegô.
2. Dituêlo go ya ka nako tsa botswêlêlo le tuêlo ya bofelêlo jaaka go dumeletswe.
3. Tirisanyô le thusô jaaka go tlhokega.

DITSHWANTSHO TSA BORULÊLÔ

Maloko a (TASA) Bokôpanô ba Borulêlô jwa Bojang ba Aforika Borwa, ba agile dithalo tse di tlhamiwang tsa mefutafuta mme ba ntshitse bopaki ba go bontsha gore borulêlô jwa bojang jo bo kgona go neela dithalwa tse di twaelegileng. Tse, ke dikao fela tse dinnye.



Borulêlô jwa Bojang ke asetetiki e kgatlhisang ya dimateriale tsa bogare



Lemoga Ditlhomeso tsa semenê



Kgurumetsô ya Lobalêlô la mabota a tšhebêlê

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Tsela e bonolo ya popô ya go fitlha dikurufela le dimmuru



Hotêlê ya Borulêlô jwa Bojang



Borulêlô jwa bojang ka dikhutlô tsa rusu

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Popêgô e
gakgamatsang
godimo ga kagô ya
semenê ka bokhutô
jo bontlê.

MATERIALE WA GO TSENYA BORURÊLÔ JWA BOJANG

BOJANG JWA GO TSENYA BORULÊLÔ JWA BOJANG LE MATLHAKA- KA KAKARETSO

Mo kgaolong ya Kapa Bophirimatsatsi mo Aforika Borwa dipopêgô tsa paêne di agilwe kwa go nang le dipopêgô tsa go agiwa ka Borôku jo botala (*Blue Gum*) /Eyukalipitase mo Aforika Borwa ka bophara.

Lenane la bojang jo bo dirisiwang mo Aforika Borwa ka tlwaelo le neetswe kwa tlase, ka thutafatshe ya mafelo a bone:

- *Hyparrhenia hirta* (e tlwaelegile go itsege e le borulêlô jwa bojang) – kgaolo ya Natal Berg, ka bontsi tota;
- *Hyperphilia dissoluta* (e tlwaelegile go itsege e le borulêlô jwa bojang jo bosetlha) - Northern Province, Mpumalanga, Northern KwaZulu-Natal le Swaziland;
- *Thamnochortus insignis* (kgotsa Matlhaka a Kapa a borulêlô jwa bojang, e tlwaelegileng go itsege e le “dekriet”,) – dikgaolo tsa Albertinia le Riversdale tsa Kapa;
- *Hyparrhenia dregeana* - Dinagagare tsa Natale le kgaolo ya Berg;
- *Hyparrhenia filipendula* (e tlwaelegile go itsege e le borulêlô jwa bojang jo bo borethe) - KwaZulu-Natal, kgaolo ya lebopo ya “Zululand coastal”;
- *Thamnochortus erectus* le *Thamnochortus specigerus* (dekriet kgotsa matlhaka a borulêlô) – dikgaolo tsa Kapa “Cape coastal”;
- *Chondropetalum tectorum* – kgaolo ya Kapa;gotlhelele; (**Ga e a atlanegisa**)
- *Phragmites australis* (Matlhaka a Norfolk kgotsa bojang ba Moraga, jo bo itsegeng ka tlwaelo ya selegae gore ke bojang jwa Umhlanga) – mo Aforika Borwa gotlhelele. (**Ga e a atlanegisa**)

Dimateriale wa borulêlô jwa bojang, legale fa go sa nna jalo ka totobetsô, di tshwanetse go sala morago lenane la bojang le matlhaka a tlwaelegileng go dirisiwa mo Aforika Borwa ka thutafatshe ya mafelo a bone.

Se se raya gore borulêlô jwa bojang ke mokgwa wa borulêlô, go ya ka hisetori, wa go dirisiwa ka katlêgô jaaka khuruphetsô ya borulêlô e e maleba go mafelo a thutafatshe, gape bo tshwanetse go kotulwa ka nako e kgolô e emeng kgotsa peo e budule e kanamisiwa.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Tsenyô nngwe le nngwe ya borulêlô jwa bojang le dithulaganyô tsothe tsa timamolelô tse di dirisiwang, di tshwanetse go se ame tsamao ya botshelo ya materiale wa borulêlô jwa bojang, kgotsa go se fetole tlhago ya materiale pele.

Borulêlô jwa bojang bo tshwanetse go bolokega ka mokgwa o netefatsang gore ga gona tshenyô mo tikologông ya bogodimo jwa kutu e e kgakala le lefatshe mme go sena tthagêlêlô e e botlhaswa go bosa.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

TOTOBÊTSÔ YA GO TSENYA BORULÊLÔ JWA BOJANG

Bojang Jo bo tlwaelegileng kgotsa bojang jo bo borethe (Hyperrhenia Hirta le Hyperrhenia Phillependula) go dirisiwa bo tshwanetse:

1. Bo nne le boleele jo bo kgaotsweng ka bo nnye ba 0,8m (bo lekanyeditswe go tloga mo bokhutlo moragô le kakarêtsô ya dintlha tsa bofelêlô jwa peo.)



Boleele jo bo segilweng 0.75m ka phoso



Boleele jo bo simaeng ba go segiwa go feta 0.8m

2. Go nna le molagare wa minimamo le molagare wa makesimamo kwa bokhutlo moragô wa 1,2mm le 2,5mm ka tatelanô;



Molagare wa phoso wa bokhutlo moragô ba phoso: 1mm.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Molagare wa bokhutlo moragô magareng ga 1.2m le 2.5mm.

3. Go nna ka go tlamalala (sega noutu ya ntlha kwa godimo);



Noutu ya ntlha e e segilweng kwa tlase ka phoso, bona borulêlô jwa bojang jo bo kobêgileng.

Se se tla umaka bogodimo jo bo sa feleng montle ga borulêlô ba gago.



Sega noutu ya ntlha ka mokgwa o o siameng

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

4. Golôsega dimateriale tse di repileng;



Borulêlô jwa bojang jo bo bokoa jo bo sa kamegeng ka nako ya Kotulô bo nale dimateriale tse di repileng.



Borulêlô jwa bojang jo bo siameng jwa dimateriale tse dingwe le tse dingwe tse di repileng

5. Ga ya tshwanela go nna mo setlha sa kgolô

6. Tshwanetse go golôsega ga ditlhôgô tsa peo fa go segilwe



Sampole e e tshotseng ditlhogo tsa peo morago ga go segilwa



Sampole e e golosegileng
ditlhogo tsa peo ka nako ya
kotulô

TÔTÔBETSÔ YA MATLHAKA A KAPA

Matlhaka a Borulêlô jwa Bojang (Mofuta wa *Thamnochortus*) a tla dirisiwa go:

1. nna le minimamo wa boleele jo bo segilweng ka 1,0 m (ka go lenkanyetswa go tswa mo morago bokhutlô le bokutlhô jwa dipeô)
2. ba na le minimamo wa molagare wa 1,2 mm le molagare wa makesimamo ya 5 mm kwa bokhutlô morago;
3. Go tthamalala ka amogêlêsêgô



Sampole e e sa amogêlêsêgang ka tthamalalô

4. e kgona go berêkisiwa;
5. e seke ya segiwa ka lobaka lwa kgolô (go netefatsa gore dinoutu di bofegile)



Setshwantshô se se bontsha gore
letlhaka le le segilweng ka lobaka lwa
kaolô (ka moo dinoutu di aoloseaile)



Dinoutu tsa go segiwa go tswa mo
setlha sa kgolô
(Ka moo dinoutu di bofegile tôta)

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

6. go butswa le go tthamalala;
7. go golosega motlhaba le siliti;
8. go omelela mo letsatsing ka bonnye jwa malatsi a 7 pele ga tshobokô.



Mokgwa o o phoso wa polokelô ya matlhaka a Kapa, go tletse dipêo le matlhare



Pharologanyô ya boleng jwa matlhaka
Phêtogo ya mebala ya matlhaka a sa golang

TOTOBETSÔ YA MATLHAKA A METSI

Matlhaka a metsi (*Phragmites australis* kgotsa *Phragmites communis*) a tla tshwanela ke go dirisiwa go:

1. nna le minimamo wa boleele le makesimamo wa boleele jwa 1,5 m le 1,8 m, ka tthoafalô (ka go lekanyetsa go tswa mo bokhutlô morago le go akaretsa bokutlhô jwa dipêo)

POLOKELO YA BORULÊLÔ JWA BOJANG KA FA TENG GA SETSHA

Dimateriale tsa borulêlô jwa bojang di tla bolokega gore:

1. Bogodimo jwa kutu ga ba senyega popêgô,
2. Ditshobokô di tlogile mo fatshe,
3. Ditshobokô ga di a bônalêsêga mo go leng bongôla le letsatsi



Polokelô ya borulêlô jwa bojang ya phoso ka fa teng ga setsha



Polokelô e e siameng ya borulêlô jwa bojang ka fa teng ga setsha



Matlhaka a Kapa a boleng jo bo siameng a tthatlaganeng ka tshiamo

PHEPAFATSÔ LE TSHOBOKÔ

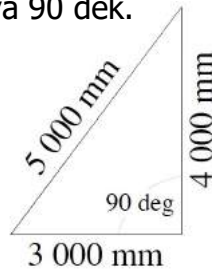
Moragô, fa bojang bo fetsa go segiwa le go sobokanngwa, tshobokô nngwe le nngwe e tshikinywa ka matla go lêlêka dimateriale tsa go golosega. Ditshobokô di phephafala ka go fetisa sikele go tswa kwa godimo le go ya kwa tlwase. Ditshobokô tsa bojang di nale molagare o leng magare ga 75 le 100 mm. Tshobokô nngwe le nngwe e bôfiwa ka mogala wa bojang jwa sokasoka kgotsa ka thapo le go pitlagana ka dihupu.

Ditshobokô tsa borulêlô jwa bojang di lekanyetsa molagare wa 75mm, di bofilwe ka thapo mme ditlhathlagane ka tsepamo.

SEBOPÊGÔ SA BORULÊLÔ

GO RAPALATSA GA SEBOPÊGÔ

Fa dipala di tthomilwe, go botlhokwa go netefatsa gore dikhutlo di mo 90 dekeri. Tsela e e bonolo go feta ke go netefatsa ka go dirisa ditekani tsa sekwalakwatsô kwa tlase go netefatsa gore khôna ke ya 90 dek.



Go bonolo tôta go baya letlhakore le tlhomošo ka go rapalatsa ka mo setsheng mme le ka go dirisa molagare wa gago wa kago mo fatshe, gape o tshwaye maemo a dipala mo molagareng mme o dire fela jalo le mo maboteng. $A = 6,100 \div 2 = B 3,050$

Boemo ba letlhakore = C 3,050 (jaaka B 3,050)

D 7,800 a bokgakalajotlhe mo magareng ga maemo a letlhakore.

Go balela katolosô ya tlhomošo $D 7,800 \div 900\text{mm}$ (makesimamo ya katolosô ya tlhomošo) = 8,666 diphatlha magareng ga ditlhomošo. (Ka metlha yotlhe ka bonnye fela e seng ka bontsi go feta 900mm),

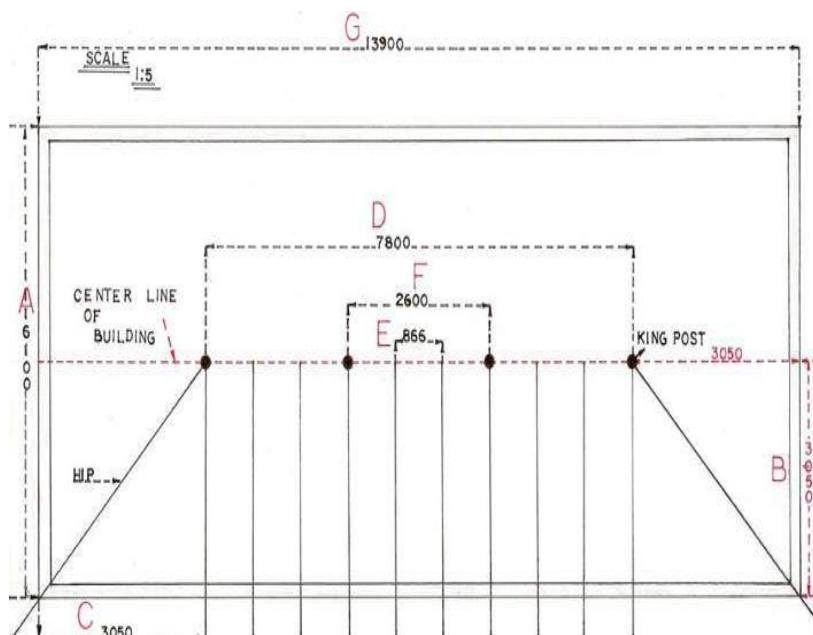
Ka moo $D 7,800 \div 9$ diphatlha = E 866mm katolosô ya ditlhomošo.

Dikôta tse kgolo tsa go rwala marurêlô le sefata dibalelwa e seng go feta 2,700 mo ntlheng e ke F 2,600.

Center Line of Building –
Molagare wa Moagô

Scale- Sekala

King Post- Dikôta tse kgolo tsa go rwala marurêlô

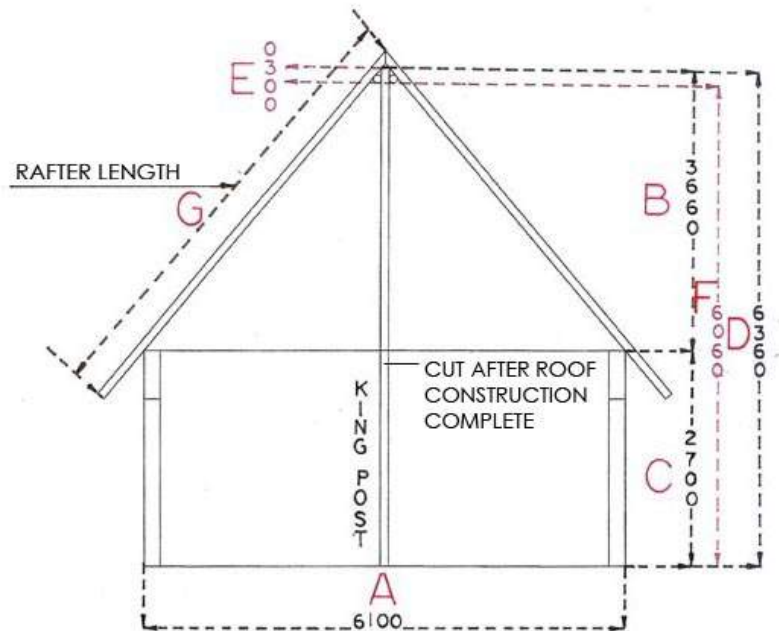


KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

RAFTER LENGTH- BOLEELE JWA TLHOMESO

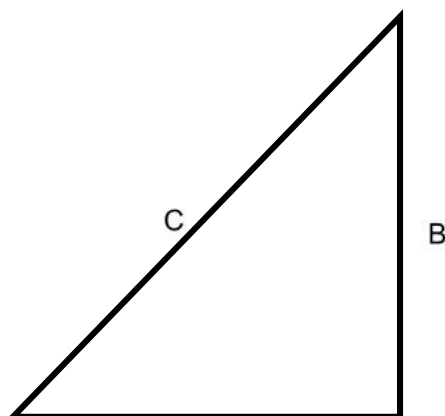
KING POST- DIKOTA TSE KGOLO TSA GO RWALA MARULÊLÔ

CUT AFTER ROOF CONSTRUCTION COMPLETE- E SEGA MORAGO FA KAGÔ E FEDITSE



Borulêlô jwa bojang bo tshwanetse go nna le minimamo ya boithômôkhutlo jwa 45°. Go tshokaga thulama e mokong gore metsi a kgone go siana go tswa mo bogodimo jwa borulêlô ka tsênêlêlô ya minimamo ka mo mmeleng wa kôbô ya borulêlô. Ka boithômôkhutlo jo bonnye go feta 45° borulêlô jwa bojang bo tla bôla ka bofefo. Boithômôkhutlo jo bo mokong bo ka tswa mosola ka go dirisa katolosô ya borulêlô jaaka phaposi e nngwe gape.

Go balela boleele jwa boithômôkhutlo jwa borulêlô o ka dirisa dipalokatiso tse kwa tlase go ya ka khutlo ya borulêlô. A = bophara, B = bogodimo, C = palokatiso ya go balela boleele jwa boithômôkhutlo



KHUTLO	A	B	C
35 dek	1.000	0.700	1.221
40 dek	1.000	0.839	1.305
45 dek	1.000	1.000	1.414
50 dek	1.000	1.192	1.556
55 dek	1.000	1.428	1.743
60 dek	1.000	1.732	2.000

Gantsi bothata ^A bo baka ke go rulagangwa ga phoso le letlhôkô ya kitsô. Fa boleele jo bo siameng ba dipala bo sa balelwa sentlê, ditsela bokhutswane di tsile go tshagêlêla i.e. phokotsô ya bogodimo go akaretsa ditlhomeso tse khutshwane.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Ditaele tsa boithômô, di ka rekiwa kwa lebentlêlê le nngwe le nngwe la di diriswa mme go sena tshenyegelô.



Boithômô jwa borulêlô kwa tlase ga 45° e tlhokegang



Boithômô jwa borulêlô jo bo kgolo ba go siama ba 45° kgotsa le go feta



Boithômô jwa phoso ba borulêlô jwa bojang



Boithômô jwa borulêlô jwa bojang jo bo siameng

DITLHOKEGÔ TSA KÔTA

Dipala tsa dikôta di tshwanetse go sala morago ditlhokegô tsa SANS 457-2 kgotsa SANS 457-3, jaaka tse di maleba. Lobalêlô le dikotana di tshwanetse go sala morago ditlhokego tsa 1288, 1707-2 (eyukalyptase), kgotsa SANS 1783-4 (paêne), jaaka tse di maleba. Dikôta tsotlhe di tla tshwanela ke go nna le pabalêlo ya go tshola go ya ka tumalanô ya ditlhokegô tsa SANS 10005.

Dipala di tla dirisiwa jaaka diêlêmêntê tsa popêgô di nne le molagare wa bonnye ba 100 mm di lekanyetsa bokhutlô jo bo sesane.

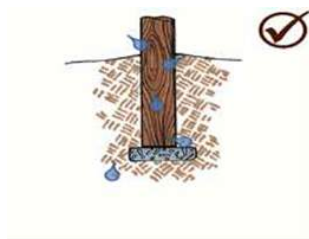
GO TLHOMELA DIKOTA TSA KA FA GARE TSA GO RWALA MARULÊLÔ

Saense ya go tshola kota sentlê e babalêla gore khemikale ya go somarêla e tlatse ka mogare ga kota ka matute ka moo e neela boteng jwa go huparêla ba tsholô ka go dikologa pelokota ka fa gare. Go botoka fa kota ya tsholô e rekiwa ka selekanyô se o ikaelêlang go se dirisa ka sone. Fa e le gore gago jalo mme wa sega kota, o ka bônatsha pelokota ya kota e senang tsholô.

Go botlhokwa go tshegetsatsa boitekanêlo jwa tsholô ka pelontlê o ka fofora ka khemikale ya go somarêla e e maleba s.k. Creosote (*Copper Chrome Assonate*) kgotsa CCA, ka mogare ga bogodimo jo bo segilweng, gore kota e seke ya bola. Ga wa tshwanela go tlhomela bokhutlô jwa pala kgotsa lepolanka mo fatshe. Bogolo o dirise bokhutlô jo bo sa segiwang. Fa o ka sega bokhutlô jwa pala, o tshwanetse go êmisêtsa ka di polêiti tsa go se phatloge.

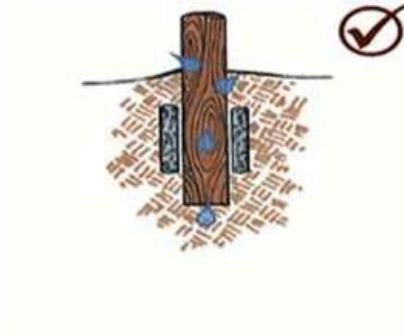
Fa e le kota, s.k. kota e kgolo ya go rwala marulêlô e e tlhomilwe mo fatshe, go tshwanetse go letlêlêlwê gore go nne le kgamolo ya metsi a pula ka kota. Ga wa tshwanela go tshela samente.

Pala nngwe le nngwe e tlhomilweng mo fatshe e tshwanetse go nna ka karologanyo ya minimamo wa H4. Fa pala ya tsholô e tlhomilwe mo fatshe, go botlhokwa go okomêla kgamolo ya metsi a pula.



ÊMA: Fa pala e tlhomilwe godimo ga thêo ya konkereiti, netefatsa gore thêo e omile gotlhe pele o ka tlhomela pala

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



KHÔLÔRÔ: Fa konkereiti e diriswa, letlêlêla konkereiti go bopa khôlôrô ka pala e tswelang kwa ntle mo tlase go letlêlêla go kôlôba ga kgamolô.



SENÔ: O seke wa letlêlêla gore pala e ême ka mogare ga thêo ya konkereiti mo tlase ka gore e tla bôla ka mogare ga kôlôbô e sa kgoneng go kgamolega

Dintlha tsa ditshwantshô kwa godimo di thusa ka kgamolo ya kôlôbô nngwe le nngwe e e ka nwang ke pala ya kota. Go tshwanetse go dirisiwa moenjênêre wa bogakolodi ba ditlhommo ka dintlha tsa ditlhokegô tsa go tlhomela dipala.

O seke wa tsenya gare bokhutlô jwa dikota tsa go rwala marulêlô tsa konkereiti tse di tlhometsweng. Fa o tlhoka go dirisa konkereiti gone, letlêlêla konkereiti e kgone go bopa khôlôrô ka go dikologa kota ya go rwala marulêlô e tswelang kwa ntle ka konkereiti.

Fa o tlhoma kota ya go rwala marulêlô mo konkereiti kwa tlase ga mosima letlêlêla konkereiti go ala pele o ka tlhoma kota ya go rwala marulêlô.

Mosola le tirisô ya karologanyo e simeng ya H ya khemikale ya go somarêla ya kota e tshotsweng, e tla go neela dingwanga tse dintsi tsa bodirêlô jo bo kgotsofatsang e tla katoloswa le go feta ka tshegetsô e siameng.

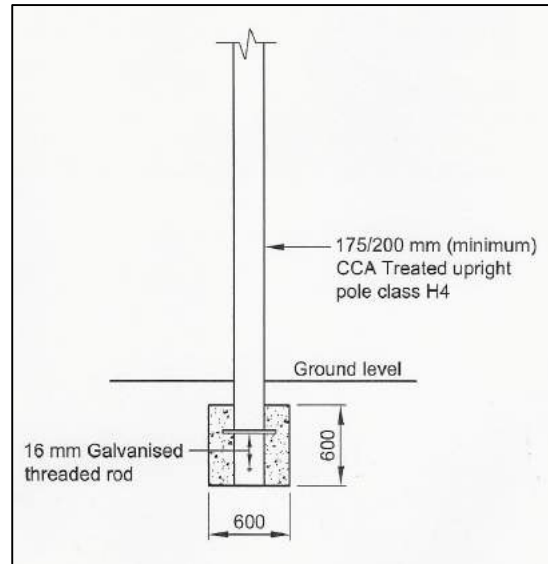
DIPILARA TSE DI TSEPAMENG

Dipilara tse di tsepameng di tshwanetse go katologanngwa e seng go feta dimetara tse 3.5 kwa thoko mme e ka seke ya nna kwa tlase ga 175 mm (molagare kwa godimodimo) kgotsa jaaka e tôtôbatsa ke moenjênêre wa ditlhomô.

175/200 mm (minimum)
CCA Pala e tshotsweng e tsepameng,
tlelase H4

Kgato fa fatshe

16mm Thupa ya tlhale ya kalabone



DIKOTA TSE KGOLO TSA GO RWALA MARULÊLÔ

Dikôta tsotlhe tse kgolo tsa go rwala marurêlô di tshwanetse go nna le dibôpô tsa polamô tse di ngaparentseng kwa godimo ka nako ya motlha wa kagô yôtlhe. Se se tla fokotsa marulêlô a a sa tthamalalang.



Boêmo jo bo siameng jwa polamô bôpô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Boêmo jwa polamô bôpô ba phoso

DiIpilara tse di tsepameng ga di a katoloswa go feta dimetara tse 3.500 kwa thoko le minimamo wa mosipori wa tshekeletsa wa bokima jo bo seng kwa tlase ga 150mm Ø mo moagong monngwe le monngwe. Fa moagô o oketsega ka bophara, bokima jwa mosipori wa tshekeletsa bo a oketsega (ka go obamela go amogelesega ya moenjênerê).

Dipala tsa go dirisiwa jaaka ditlhomeso di tla tshwanela ke go nna le molagare wa bonnye jwa 100mm bo lekanyediwa kwa boresaneng jwa pala.

KATOLOSÔ YA DITLHOMESO



800 mm
Katologanyô ya tlhomeso e siameng, makesimamo wa 900mm go tloga kwa bogareng go ya kwa bogareng jo bongwe



1 000 mm
Katologanyô ya tlhomeso, e bontsha go feta bogare jwa 900 mm jo bo dumeletsweng.

KATOLOSÔ YA SEFATA



Mosipori wa tshekeletsa wa Botsereganyi

Katologanyô ya sefata e e katolositsweng ka tshiamisô e seke ya feta 2.700m kwa thoko

KATOLOSÔ YA MOSIPORI LE BOÊMO



Sepane ke se se tona tôta, se bontsha phaphogô ka mo paleng ya mokwatla.

Diphatla tsa mosipori le boemo tse di sa seleaneng gotlhe. Fela mosipori e leng ngwe mme go sena dikota tse kgolo tsa go rwala



Mosipori le dikota tsa go rwala marulêlô a go lekana.

DIKGOLAGANÔ TSA MORIPORI WA TSHEKELE TSA

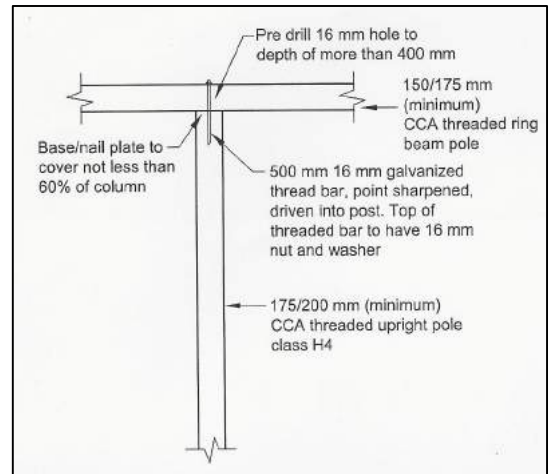
Terata pele ga mosima wa boteng jwa go feta 400mm

150/175mm (minimum) CCA pala ya faebara ya mosipori wa tshekeletsa

500mm/16mm bara ya kalabone ya faebara, ntlha e e lositswêng, kgatelelô ya kotana e kgolo ya go rwala borulêlô

175/200mm (minimum) CCA pala ya faebara e e tsepameng, tlelase H4

Poleiti ya motheô/sepekere sa go khurumetsa khôlômô e e seng bonnye jwa 60%



Go nale dithaêlô di le dintsi tsa mosipori mme go na le mabaka a a botlhokwa a mararo:

1. Selekanyô sa mosipori wa tshekeletsa ke se se nnye tôta.
2. Dipilara tse di tsepameng di beilwe fa thoko kwa kgakala (Mo thulaganyô e kgonegang ya difata godimo ga dikota tsa go rwala marulêlô).
3. Ga gona mosipori mo sebakeng se se oketsa tobeletsô engwe gape mo mosipori wa thsekeletsa.



Go bontsha sekao sa sepakêla le kgolaganô ya mosipori wa tshekeletsa godimo ga dikota tsa go rwala marulêlô.



Go bontsha kgolaganô ya mosipori wa tshekeletsa le dikota tsa go rwala marulêlô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Kgolaganô e sa siamang ya mosipori wa tshekeletsa le dikota tsa go rwala marulêlô. Lemoga sepekere fela!



Phaphosô ya mosipori wa tshekeletsa .

Minimamo wa bokima jwa mosipori wa tshekeletsa gore o seke wa nna kwa tlase ga 150mm molagare o lekanyeditse kwa bohesaneng ba dipala. Fa boagô bo oketsega ka bophara le bokima jwa mosipori wa tshekeletsa o a oketsega (ka go obamela methalô ya moenjênêrê)

PHAPHOSÔ



Go bontsha kokeletsô ya dikota tsa go rwala marulêlô a tshegetsang mosipori kwa tlase.



Mosipori wa tshekeletsa kwa ntle ga phaphosô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Go bontsha go sena phaphosô mo paleng ya 14m. Dipane tsa boleele ka nako ya kagô di tlhoka go tshegediwa go fokotsa phaphosô.



Phaphosô

Go bontsha phaphosô. E e bakang ke dipala tse tshesane le go rwala pele mesopori e beiwa sentle

DITSHEGETSI TSA PHEFÔ



Setshegetsi sa phefô

Go bontsha mosipori wa ditshegetsi tsa phefô ka sepakelô mo letlhakoreng la kwa tlase ga dipala tsa tlhomošo.



Sebopêgô sa borulêlô se se weleng ka lebaka la go tlhoka tshegetso ya ditshegetsi tsa phefô.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

DIKOTANA LE LOBALÊLÔ

Dikotana kgotsa lobalêlô di tla tshwanela ke go tswelêlêla pele godimo ga ditlhomeso tse tharo (sk. katolosô ya ditlhomeso tse pedi) mme e tla nna le tlhomamo mo tlhomeso nngwe le nngwe e ba e tshelang. Dikotana di tla tshwanela ke go tlhomelwa ditlhomeso ka dipekere tsa tshipi tsa 75 kgotsa 100 mm. Go tla nna le tlhokomelô ya gore go seke ga nna le yo mongwe wa maloko yo o kgaolwang ka nako ya tsamaiso ya tlhomelô ya depekere.

Dikhutlo tsa dikotana di tla tshwanela ke go rokelelwe sekwêrê le gore le kopangwe ka fa morago ka bogare godimo ga mongwe wa leloko la ditlhomeso. Dikopanelô ka mo dikotaneng di tla thulaganngwa gore nngwe ya tsone mo tse tharo di kopangwe mo go tlhomeso nngwe le nngwe e le nngwe fêla.

Dikotana le lobalêlô lo lo dirisitsweng e tla nna le minimamo wa molagare wa 38x38 mm le 25mm (molagare kwa godimo) ka tatelanô mme dikatolosa go ya ka ditlhokegô tsa tatelanô ka mefuta ya dimateriale tsa borulêlô jwa bojang jo bo dirisitsweng.

KATOLOSÔ YA LOBALÊLÔ

Laths	Length of reed or thatch mm	Max laths Centres mm
First lath from batten	-	200
Second lath from batten	-	150
Second from top	-	150
All other battens	800, 1 200, 1 500	200, 300, 350

The maximum batten centre is determined by dividing the length of the thatch by 4.
Nails shall have a minimum diameter of 2.8 mm

Lobalêlô	Boleele jwa matlhaka kgotsa Borulêlô jwa bojang	Mak. Lobalêlô le bogare mm
Lobalêlô lwa ntlha la kotana	-	200
Lobalêlô lwa bobedi la kotana	-	150
Ya bobedi go tswa kwa godimo	-	150
Dikotana tsotlhe tse dingwe	800, 1 200, 1 500	200, 300, 350

Makesimamo ya bogare jwa kotana e ikaelelang ka go kgaogantsha boleele jwa borulêlô ka 4.
Dipekere di tshwanetse go nna ka minimamo wa molagare wa 2.8mm

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Jaaka tafola e kwa godimo



Katolosô ya lobalêlô go gaisa moolwane wa makesimamo jaaka e bontshiwa mo go tafola e e kwa godimo, gape e bontsha go feleletsa ga borulêlô jo bo bokoa.

MEGOROGORO

Megorogoro ya borulêlô jwa bojang e tshwanetse go bopa go ya ka tsamaisô ya boiketlo ka go soboka boalô bongwe le bongwe go tloga mo tshupetsô ya tlhamalatsô-tsepamô go ya ka e le nngwe e e bapileng le mogorogoro. Kokêlêtsô ya dimateriale e tla alwa mo mogorogorong go abalêla bokima ba koketsegô go thibêla tsenelêlô ya metsi mo boalông jwa borulêlô jwa bojang mme go abêlêla go fêêla ka boiketlô bogolo gona le bogale jo bo kôbêgang.



Kgaolo ka mogorogoro wa bojang e e bontshang bokima jwa boalô godimo ga mogogoro.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Ditlhatlhaganô tsa mogôrôgôrô di letlêlêtswe go dirisa kalabone kgotsa (e e sa tshwanelang Matlhaka a Kapa), papetla, ya aluminiâmô, koporo kgotsa ditlhatlhaganô tsa mogôrôgôrô tsa borase tse di dumeletsweng. Bokima jwa dimateriale tse ga bo a tshwanela go nna jo bo nnye go:

- 0.4mm ya papetla ya kopôrô
- 0.5 mm ya papetla ya kalabone
- 0.7 mm ya papetla ya Aluminiamo



Megôrôgôrô ke yona ya ntlha ya go gatêlêla borulêlô bongwe le bongwe jwa bojang



Tlhatlhaganô ya mogôrôgôrô o tsentswe go gatêlêla mogôrôgôrô



Tlhatlhaganô ya mogôrôgôrô o o feditswena ao tsenawa

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

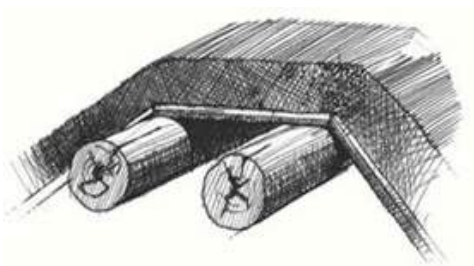
MATLHAKORÊ

Go tshwanetse gore go nne le tlhokomelo ya matlhakore a borulêlô jwa bojang go netefatsa gore ditshobokô tsa bojang kwa bokhutlong jwa letlhakore la tlôkôla go tihêtha a go bapa le letlhakore la tlhomsô. Ka fa thoko ga letlhakore lengwe le lengwe, fa go tswelera pele kgakala le lona, ditshobokô di tsamaisiwa ka boiketlô go fitlhelela di tlamalala ka tsepamo mo dikoteng tsa go tshegetsatshegetsa. Go tshwanetse go nne le tlhokomelô go netefatsa gore bokima ka botlalô jwa borulêlô jwa bojang bo babaletswe fa go tswelera pele go dikologa kobegô ya letlhakore.

Kitlanô ya ditlathaganô tsa borulêlô jwa bojang mo matlhakoreng e ka nna kwa tlase go na le kwa godimo ga dikgaolô tse di phaphati le koketsô ya borulêlô e ka tlhokega. Matlhakore a borulêlô a ka tlhoka pabalêlô ya tlhomamô ka ntlha ya potlakiso ya bosa e gantsi e amanang le kitlano e e kwa tlase. Tirisô ya matlhakore a mabedi a matlhasedi, le lengwe kwa thoko ga sekhutlô sengwe le sengwe, e ka neela thêfosano e e amogelesegang ya mathata a a tlhodilweng ke sekhutlo sa 90°.



Karolo e e leng gore letlhakore le bontsha pala e le nngwe le tlathaganô ya borulêlô jo bo sesane godimo ga sekhutlô.



Karolo e leng gore letlhakore le bontsha kagô ya dipala tse pedi ka bokima le tlathaganô ya borulêlô jwa bojang jo bo kitlaneneg ka sekhutlô sa 135 dek.

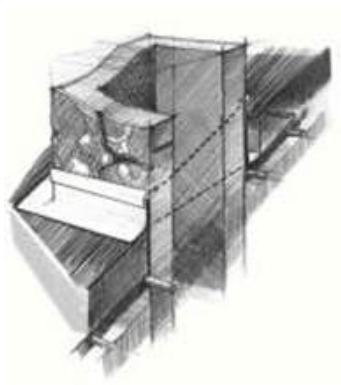
MELELWANE

Sekhutlo se go beilweng ditshobokô, mo go kopanang mathudi le molelwane di tshwanetse go babalelwa go fêêla borulêlô sentle, go fitlhelela kwa bogodimong jwa mokwatla.

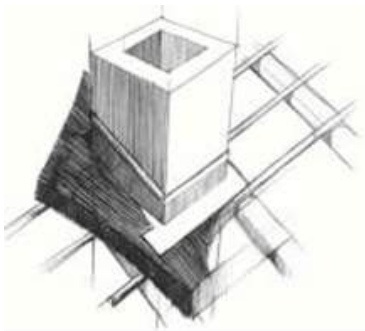
DINTSHAMOSI

Dintshamosi di tla thalwa le go agiwa ka go dirisa fela dimateriale tse di sa tukiseng le dithotô tse di tshwanetseng go amogangwa ka go lekana le tsa lebota le le agilweng 200mm go akanya ka moagi wa lebota la matlapa fa e se ka mothalô o o rašenale, e baakantswe ke motho wa bokgoni.

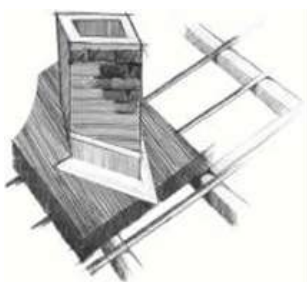
Bogodimo jwa thatlhagano bo tshwanetse go katolose tswa sedikisi le fa e nna metara (selekanyô go tswa kwa godimo ga thatlhagano, gaufi tôta le borulêlô) godimo ga sekhurumetsa sa borulêlô jwa bojang. Bo agilwe ka pabalesegô ka mo foluelê e dikologang losi, kgotsa tshegetsô ya mamapo a tshipi a lola, kemiso-thanya e e nang le seripa sa 10 x 10 x 1 mm (minimamo) sebopô sa tshipi e e senang mebala, e lenkanang le 700 mm go tswa kwa godimo, e khurumetsa bophara jo bo tleseng jwa foluelê.



Karolo ka kgabaganyo ya sentshamosi, go bontsha boiphitlhô jwa mokoro le benya ka



Go thibela borulêlô jwa bojang go relela kwa tlase.



Thêfosano ya setshamosi ka botllalo go dira bobotlana jwa go dutla ga metsi.

DIPHAEPHE TSA TSHIPI YA PHATLA E MOSI O TSWANG KWA TENG

Go botlhokwa go netefatsa sethalo sa phaephe ya mosi le ka mo e tse tsweng ka mokgwa o e leng gore o ka se tllhagise kotsi ya molelô gaufi le materealê. Phaephe e mosi o tswang mo teng ga e a tshwanela go tshwaraganya le sago šafo kgotsa tšhupu ya seedi se se dirang karolo ya tsela nngwe le nngwe ya go tllhabisamowa.

Kwa go nang le sentshamosi le furumô ya foluêlê, furumô e ntse jalo, e tla dirwa ka materealê o ganang tirô nngwe le nngwe ya meso ya foluêlê mme e tla ganetsa kwa ntle ga go phamphanyega kgotsa go lêtêfatsa, dithêmphêreitša tse e ka e baya taolong, gape e tla oketsega mo boleeleng jotlhe jo bo tletseng jwa sentshamosi.



40 x 3 mm f3mm lepôkôsô ka sekhutlô mo pitšhi ya borulêlô; (ka tlwaêlô 45 dek)

Bara e e bopharapahara ; e e Momêlêla kwa tlase

Boteng jwa 200 mm kgotsa ka bonnye; ka bokima jwa borulêlô jwa bojang

Ka thefosano setswalo sa lebokôsô la tshipi le ka emela go dirisa 20 mm ya setswalo sa lomati.



Lebokôsô la setswalo la tshipi

Boto ya semente sa kgobati 6mm

Tlosa materiale otlhe yo o repileng pele o ka baya kobo ya molelô

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Kobô ya molelô ya 1100 dek, Setswalo sa Forumô ya tshipi sa lebokôsô le botlase kwa bôtô ya semente sa kgobati

Kobô ya molelô e e khurumetsang foluêlô go ya kwa godimo ka bonnye jwa 20mm



Terata ya sefoterata e gogiwe kwa godimo ga karolô ya setswalô pele kapesô ya konkereiti e bewa

Kapesô ya konkereiti kgetlilwe go ya kwa morago gore e bontshe sefoterata ya tshipi ya kapesô 50mm ya setswalo sa lebokôsô la go tlhakanya seretse.

Borulêlô jwa bojang jo bo feletswe mo go bone kwa morago, se se netefatsa gore dinonyane ga di kgone go bofolola borulêlô ka fat lase ga setswalô sa konkereiti.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



6mm ya bôtô ya samente sa kgobati

Lemoga: Matereale tsotlhe tsa tukô di segilwe kwa morago go tswa kwa phatlheng e ka nna 230mm

Setswalo sa tshipi sa lebokôsô le tsene kwa mabalelông ka go dirisa dikurufêlô.



Sekao sa phaephe e e tsentsweng sentle

DITLHATHAGANÔ TSA SENTSHAMOSI

Go tlhokega tlhokomelô e e rileng mo dielementeng jaaka ditlhatlhaganô tsa sentshanosi le diphaepe tsa sekomelabagwe se tsena ka fa sekafong sa borulêlô. Dipopêgô tseo di tshwanetse go apeswa go thalwa ka tshipi ya papetla kgotsa galase ya kgobati e tlaelelsa polesetara e e benyang ka fa tlase magareng le fa godimo ga setlhoa sa bogodimo jwa borulêlô. Bophara jwa go benya bo tshwanetse go ba 250 go ya 300 mm.

Letlhakore la go thanya (matlhakore a mabedi a sentshamosi) le tla tshwaraganya go thanya kwa godimo (kwa tlase ga tlhatlhaganô ya borulêlô jwa bojang) ka go thanya mo fatshe (godimo ga tlhatlhaganô ya borulêlô jwa bojang), go letlêlêla metsi a kgone kgamolo gamolola kwa godimo ga bogodimo jwa borulêlô jwa bojang. Go thiba go relêlêla ga borulêlô jwa bojang kwa godimo le kwa tlase ga letlhakore, borulêlô bo tshwanetse go alwa go ya ka sekhutlo go sirelêtsa borulêlô jwa bojang mo lobalêlô la khutlômabapi le go thanya mme ka nako e le nngwe gape bo khuremetse letlhakore la go thanya.

Tlhatlhaganô ya borulêlô jwa bojang ga ya tshwanela go kopana kwa godimo le kwa matlhakoreng a mabedi a sentshamosi gore e kgone go letlêlêla go elala ga metsi a a tswang kwa go thanyeng kwa godimo go ya kwa tlase. Borulêlô jwa bojang bo tshwanetse go baakanngwa go dikologa sentshamosi (kwa godimo le kwa matlhakoreng a mabedi) go bopa tšhanelê ya bonnye ba 50 mm magare ga borulêlô jwa bojang le sentshamosi.

Ka thefosanô, go thiba kgonagalô nngwe le nngwe ya go dutla e e tlwaetseng go nna le bokopanô le dintshamosi, dikagô le/kgotsa borulêlô di tshwanetse go nna jaaka go tlhatlhagana ga sentshamosi go tsenya ka metlha borulêlô mo karolông ya mokwatla. Fa se se ka seke sa kgonagala, tlhatlhaganô e ka sôkama ka 45°, mme ga agiwa ka go bapa le sebopêgô sa borulêlô, ka jalo go tlosa bothata ba go tlhama mekoro e e iphitlileng le bothanyô jo bo raraaneng, j.l.jl, go letlêlêla metsi go elela kwa ntle ga go rothêla godimo ga bothanyô.

MAMÊNÔ A BOJANG JO BO TSWALELANG DIPHATLHA

Dikaromo tsa dipekere ka fa gare ga mosipori wa tshekeletsa magareng ga ditlhomeso, ka go tlhama diphatlha tse di nnye, go rokêlêla le go sokasoka ka dikaramo mme le go dikologa lobalêlô. Baya borulêlô jwa bojang go bopa mamênô. Bofa tôta tshobokô, sega tshobokô ya go fetisa. Goga tshobokô ka go dikologa go fitlha mafutô ka mo morago ga lobalêlô. Sega mogala ka saese mme o o karamo ka go dikologa tlhomeso.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Mamenô a bojang jo bo tswalelang diphatlha a ka kgona go emisetsa setena kgotsa tlalêlêtsô ya serêtsê ka mosipori. Mogala wa borulêlô jwa bojang go totisa mesopori ya tshipi ka asetêteki.



Sekao kwa tlase sa bokhutlo jwa go tlatša ga mosipori bo dirisa mamenô a bojang jo bo tswalelang diphatlha.



KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Sekao sa dikhutlô tsa digabole tsa mamenô a bojang jo bo tswalelang diphatlha

BORULÊLÔ JWA BOJANG

BÔALÔ JWA GO NOSETSWA "SPREILAAG"

Pele borulêlô jwa bojang bo ka tswelera pele, bôalô jwa matlhaka a tlhophilweng, dikutu tse phephafaditsweng tsa borulêlô jwa bojang kgotsa matlhaka a Kapa a borulêlô jwa bojang, bo itsege jaaka bôalô jwa go nosetswa (spreilaag), bo adiwa ka tekanyo mo dikotaneng tsa borulêlô ka bokima ba go tloga mo 5 go ya kwa 8 mm.

Ka bojang go diriwa letlôpô ka go kgwetsa go le gonnye 75 x 3.5 mm-molagare wa go dikologa dipekere tsa tshipi ka mo paleng ya go phakarisa ka boleele jwa 300 mm. Dipekere di katologane ka 12 mm, ka mola wa tlhamalalô. Ditshobokô tsa bojang di adilwe ka go kgabaganya go ya kwa godimo ga letlôpô di gateletswe go ya kwa tlase gore matlhokwa a kgaogantswe ka dipekere. Janong tshobokô e gogiwa ka letlôpô go tloga kwa godimo go ya kwa bokhutlong kwa tlase.

Bôalô jwa go nosetswa jo bo repileng, sega go lekana sentle magareng ga mabalêlô a dikota ka mo gare ga borulêlô jwa karolo ya mokwatla e dirisiwa go feleletsa mokwatla go tloga ka fa gare. Fa go sa dirisiwa bôalô jwa go nosetswa jo bo tlhophilweng, go atlanegisiwa gore bojang jo bo phepha jo bo tlwaelegileng bo dirisiwe jaaka bôalô jwa mo tlase go tlhama bogodimo jo bo phepha ka fa gare ga borulêlô, (jo bo lekaneng go fitlha bôalô kwa godimo). Se se naya pônâlô ya asetetiki ka fa gare ga setswalô sa borulêlô.

Borulêlô jwa bojang kgotsa borulêlô jwa matlhaka bo tla kamiwa ka letlôpô le le maleba go netefatsa gore matlhokwa a phepha pele a tsengwa.

ÊLATLHOKÔ: Letlôpô le ka bopiwa ka go kgarametsa 75 mm ya dipekere tsa terata ka mo paleng e e rapameng. Ditshobokô tsa borulêlô jwa bojang kgotsa borulêlô jwa matlhaka bo tshwanetse go beiwa godimo ga letlôpô mme bo gateletswe kwa tlase gore matlhokwa a kgaoganye ke dipekere. Jaanong tshobokô e gogiwa ka letlôpô go tloga kwa godimo go ya kwa bokhutlong kwa tlase. Tshobokô nngwe le nngwe ya borulêlô jwa bojang kgotsa borulêlô jwa matlhaka di tla tshwanela ke go busetswa morago kgatlhanông le bôtô ya go busetsa morago kgotsa kgaolo ya fa fatshe go netefatsa gore bokhutlô morago bo lekalekana le dikhutlô tse di bogale di dilafetse pele di ka tsentshwa.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Phêtsô e e bokoa mo dikhutlô morago tsa bôalô jwa go nosetswa tse di sa fitlhiwang ka dikota le mabalêlô. Lemoga sokasoka la kgakamalô e repileng.



Phêtsô e e bokoa, dikhutlô tsa pêo di a bonagala.



Sekao se se siameng sa bokhutlô morago le dikhutlô tsa pêo ga di bonagale. Dikhutlô morago di. Sokasoka e gagametse ka go dikologa lobalêlô.



Phêtsô e e phepha ya bôalô jwa go nosetswa

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

PÔFÊLÊLÔ YA BORULÊLÔ JWA BOJANG

Dimateriale tse di dirisiwang di tla tshwanela ke go nna tsa tere e tshotsweng ya sokasoka ya sisale kgotsa terata ya tshipi e sa timpalang ka molagare wa 1mm le 1,2mm kgotsa terata ya galabone ka molagare wa 0.9mm. Katolosô ya motlhabo wa makesimamo wa 110 mm.

Pôfêlêlô kgotsa go golega ga borulêlô jwa bojang mo dikotaneng e tshwanetse go nna go ya ka mokgwa o o dirisitsweng borulêlô jwa bojang. Mme e seke ya katolosa go feta go arogana ka 110mm. Dimatereale tse di dirisitsweng di tla tshwanela ke go nna tsa tere e tshotsweng ya sokasoka ya sisale kgotsa tshipi e sa timpalang kgotsa terata ya galabone ka molagare magareng ga 0.9 mm le 1,2 mm.



Pôfêlêlô ya sokasoka ya tere ya Sisale



Pôfêlêlô ya terata

KATOLOSÔ YA PÔFÊLÊLÔ



Katolosô ya pôfêlêlô e phôsô, e kgolo go feta 110mm. Lemoga sokasoka ya motlhabo e e repileng.



Katolosô ya pôfêlêlô e e siameng ka 110mm. Lemoga sokasoka e e gagametseng ka go dikologa lobalêlô.

PÔFÊLÊLÔ YA TERATA KA KGAGAMALO



Terata e e repileng e sa gagamalang ka go dikologa lobalêlô.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Siamisa terata ya pōfêlêlô ya kgagamatsô e e dikologang lobaletlêlô

TWINE BINDING TENSION



Sokasoka e e repileng e sa gagamalang ka go dikologa lobaletlêlô le le tla letlêlêlang bōalô jwa borulêlô jwa bojang go relêla kwa tlase.



Pōfêlêlô ya kgagamatsô e e siameng.

TSHUNUKA

Ditshunuka di tla tshwanela ke go nna le fa e le:

1. Terata ya Galabone ka minimamo wa molagare wa 3,15mm
2. Matlhaka a Kapa ka ditshobokô ka bonnye jwa 10mm.



Tshunuka ya terata ya Galabone ya minimamo wa 3.15mm

BÔRULÊLÔ JWA BOJANG GODIMO GA DITSHUNUKA

Setswalo sa borulêlô jwa bojang godimo ga ditshunuka se ikanya ka mofuta wa materiale o o dirisitsweng le bokima jwa bôalô, mme e tshwanetse go nna bonnye jwa 40 % ya bokima jwa bôalô jo bo rileng. Setswalo sa minimamo, fela, ga se a tshwanela go nna se se nnye go tafola ya 2

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

BOKIMA JWA BÔALÔ JWA BORULÊLÔ JWA BOJANG

Bokima jwa phêlêtsô ya bôalô jwa dimateriale tsa borulêlô jwa bojang ka tatelanô bo tla latela jaana:

Mohuta	Bokima jwa bôalô jwa borulêlô jwa bojang (mm) Le gone e ka fa taolong ya bokima mo tafoleng e bontshitsweng mo SANS 10400 XA	Khurumetsa godimo ga ditshunuka kgotsa sokasoka (mm)	Molagare wa Kutu/Morago wa matlhaka (mm)
Bojang jwa borulêlô jwa bojang jo bo tlwaelegileng kgotsa jo bo borethe	175	70	1,2 to 2,5
Matlhaka a borulêlô	180	80	2,5 to 4

Khurumetsô godimo ga tshunuka.

Bokima jotlhe jwa borulêlô jwa bojang jo bo ntšha jo bo adilweng

bo ka se nne jo bonnye go 175 mm



Bokima jo bo dirang godimo ga ditshunuka tse e seng tse nnye go 70mm (Khurumetsa godimo ga itshunuka)

GO ALA BORULÊLÔ JWA BOJANG

Borulêlô jwa bojang bo tla simolola go tloga mo molelwane kwa tlase ga borulêlô mme bo tla tshwanela ke go alwa ka go bapa le ditlhomeso kgotsa difata.

Ditshobokô tsa borulêlô jwa bojang kwa bokhutlông jwa letlhakore la tlôkôtla ditshwanetse go tihêtlha ka go bapa le ditlhomesô tsa letlhakore. Bokima ka botlalô jwa borulêlô bo tshwanetse go babalêlwa go dikologa kôbêgô ya letlhakore. Fa lo sa bone fa go sa nna jalo ka go totobatsa ka tshedimosetso ya totobêtsô, bokima le minimamo ya boima ka sekwêrêmetara sa phêlêtsô ya bôalô jwa tatêlanô ya materiale bo tla tshwanela go ya ka ditlhokegô.



Go bontsha dithobokô godimo ga mabalêlô ka go ya ka tsamaiso ya go rulêla ka bojang. Boleele jwa tshobokô go neela sepene ka bonnye jwa diphatlha tse 3 i.e.ntlha e tshwanetse go fitlhelela bonnye jwa mabalêlô a 4.



Setswantsho se se bontsha go alwa ga borulêlô jo bo ntšha, jo bo neng bo sa beiwa sentle go tloga kwa tshimololong. Lemoga bokgakala go tswa kwa pôfêlêlông ya dikhutlô morago.
(Ka tekanyetso ya 100mm) Go alwa ga borulêlô jwa bojang ka phôsô bo tla fokotsa tsamao ya botshelo ya borulêlô.



Boleele jo bo molemô go netefatsa makesimamo wa botshelô jwa borulêlô ke 250mm go fitlhêla 300mm. Ntlha e e tshwanetse go lebêlêlwa ka nako yotlhe ya go tsengwa ga borulêlô jwa bojang. Go tshwanetse go nna le tlhokomelo ya go se fete 300mm ka tlwaelô le bojang jwa borulêlô jwa bojang, ka gore e ka kgona go sengwa ke phefô.

MEKWATLA

KA KAKARÊTSO

Kagô ya mokwatla e tshwanetse go nna jaaka go totobatsa ka mo sekoupong sa tirô.

1. Kagô ya pala ya mokwatla e tshwanetse go nna mokwatla le fa e le nngwe kgotsa bobedi.
2. Mo bobedi jwa dikagô tsa mokwatla, mabalêlô a mabedi a bofelelô a tshwanetse go katoloswa ka 150mm godimo ga mola wa borulêlô jwa bojang jwa bofelelô. Mola o o tshwanetse go nna le motlhabo o o kwa tlase go sirelêtsa borulêlô jwa bojang mo mafelong a mabedi. Le gônê go na le tshitshinyo ya gore matlhaka a Kapa a dirisiwe jaaka ditshunuka, mola wa bofelelô wa borulêlô jwa bojang o tshwanetse go baakanngwa ka 3.15mm ya terata ya tshunuka. Se se tla netefatsa gore borulêlô jwa bojang bo gagametse ka tshiamo kwa ntle ga go golega itshunuka. Mo terata ya 3.15mm e kopanang teng, matlhaka a kapa a ka dirisiwa jaaka sedika sa dintêlô tse di thubegang.
3. Mola wa bofelelô ga wa tshwanela go segiwa. Dikhutlô tse di kwa godimo tsa bojang di tshwanetse go meniwa godimo ga pala ya mokwatla mme e baakantswe ka mo letlhakoreng le le fapaaneng, e khurumetsa borulêlô jwa bojang mo bofelong jwa letlhakore la borulêlô. Lobalêlô le le tsentsweng ka 300mm godimo ga mola wa bofelelô jwa borulêlô jwa bojang bo tshwanetse go dirisiwa ka motlhabo kwa tlase ga bôalô jwa bofelelô jwa borulêlô jwa bojang jo bo fapaaneng.
4. Se se tshwanetse go diriwa ka mo matlhakoreng a mabedi a borulêlô.
5. Borulêlô jwa bojang jwa bofelelô jwa letlhakore la borulêlô bo tshwanetse go meniwa godimo ga pala ya mokwatla mme bo bofelelwe mo paleng ya mokwatla mme e nne le motlhabo mo paleng ka nnalata wa sekgwage.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Lemoga gore borulêlô jwa bojang bo segilwe mo mokwatleng mme o sa kobega jaaka go tlhokega.



Ditshobokô tsa bojang jwa mekwatla di tshwanetse go kobiwa mme di nne le tshirelêtso ya tshetledi ka motlhabo mo dikoteng fapaaneng tse pedi tse di kwa godimo tôta.

6. Morago ga go fetsa se se kwa godimo borulêlô jwa bojang botlhe bo tswanetse go nna le motlhabo mo paleng ya mokwatla ka nnalata wa sekgwage sa sekômpôlê.
7. Tirêgô e e kwa godimo e a tlhokega go netefatsa gore mola wa bofelelô jwa borulêlô jwa bojang ga o thêlêle kwa ntle ka motlase ga mokwatla. Gape tirêgô e e tla thibêla dinonyane go gogela borulêlô jwa bojang kwa ntle.
8. Pele mokwatla o ka tsengwa dipaakanyô tsa borulêlô jwa bojang le sokasoka di tshwanetse go tšhekiwa gape go netefatsa gore e gagametse le gore mola wa bofelelô wa borulêlô jwa bojang bo tlhamaletse mme bo ntse sentlê.
9. Mo dikgaolong tsa bothata jwa dinonyane, go tshitshingwa gore sefo e nnye ya dinonyane ya mosima wa molagare o sa feteng 25mm o beilwe godimo ga mola wa bofelelô jwa borulêlô jwa bojang le kokeletsôka bonnye jwa 900mm go tswa mo gare ga mokwatla go ya kwa tlase ka go okama. Sefo e nnye ya dinonyane e tshwanetse go nna le motlhabo mo paleng ya mokwatla go tshola se sentlê, pele o tsenya mokwatla mo godimo.
10. Marulêlô a di saese tse di farologaneng a dirisa mekwatla ya disease tse farologaneng. Marulêlô a sepane sa go fitlhêlêla 4m a dirisa mokwatla wa lapa e e leng 700mm ka bophara mme e ka khurumetsa ka bonôlô. Marulêlô a na leng sepane magareng a dimetara tse 4 le 10 a tshwanetse go dirisa mokwatla wa botlhe jwa 950mm ka bophara. Go tsenya mokwatla mo dintlung go nna gape ga dirisiwa mo marulêlô a seng mo bokhutlô jwa 45 dekeree kgotsa bophara jo bo tona tôta. Ditlhôphô tse pedi tsa bofêlêlô di ya ka tatsô jaaka mekwatla yotlhe ka bobedi e ka kgona go dirisiwa ka katlegô.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

11. Go tsengwa ga mokwatla o dirisiwa mo dikarolông ka boleele jo bo kgonagalang jwa nakô, go fokotsa go dirisiwa ga makopanêlô.
12. Go tsengwa ga mokwatla go ka kgona lekantshwa janong mme tse di latelang di tshwanetse go elelwa tlhokô fa o lekantsha mokwatla. Go tsengwa ga mokwatla o tshwanetse go beiwa ka go repa mo boêmông jo bo siameng mme bo futêditswe ka ditshobokô tsa bojang tse di gagametseng, lobaka lwa se ke gotlatsa phukutsa nngwe le nngwe e dirilweng magareng ga go tsengwa ga mokwatla le borulêlô jwa bojang.
13. Morago ga go futêtsa ga mokwatla, mokwatla o ka gogelwa kwa tlase, godimo ga borulêlô jwa bojang. Terata nngwe le nngwe ya boraro e tshwanetse go gogiwa ka gagamalô mme e bofêletswe mo lobalêlông la bofêlêlô, terata e tshwanetse go rokiwa ka go sutlha borulêlô jwa bojang go ya ka bokhutlô gore e kgone go tlosa gore metsi a go rêlêla a seke a sala morago go baakanngwa ga borulêlô. Go baakanya ka go fitlhelêla lobalêlô la bofêlêlô, go netefatsa gore paakanyô e ka fa tlase ga mokwatla mme e seke ya ama ke metsi. Lobaka lwa gore fela terata nngwe le nngwe ya boraro e baakanngwe ke gore tshwara mokwatla mo boêmông jo bo siameng fa santse Sepotara mo fatshe se nyalanya le moagi wa borulêlô jwa bojang go tthamalatsa mokwatla ka bokhutlô le kgato tsa go siama. (Go botlhokwa tôta go dirisa baagi ba borulêlô jwa bojang, jaaka go sa kgonegi go tsenya mokwatla sentle fa fela go dirisitswe moagi wa borulêlô jwa bojang.)
14. Go tsengwa ga rontabolô kgotsa kapi ya sekwêrê go tshwana le mokwatla o o tlwaelegileng ka tumelanô ya gore borulêlô jwa bojang bo tshwanetse go rokelelwa mo paleng e kgolo e tlhagisang minimamo wa 200mm godimo ga mola wa bofêlêlô wa borulêlô jwa bojang.

MEKWATLA YA NTLO YA BOJANG

Ditshobokô tsa go tsengwa ga mokwatla wa bojang di tla romêlêlwa go feta godimo ga mokwatla mme ka tshirêlêtsô ya go itsetsepêla godimo ga dikota tsa kwa godimo tôta ka ditshunuku le mokgwa o o maleba wa go bofêlêla kgotsa go tlama.

MEKWATLA YA NTLO YA GALASE YA FAÊBARA

1. Galase ya faêbara e ka dirwa ka boleele jo bo fitlhelang dimetara tse 9.
2. Mesima ya 2 x 2mm e tshwanetse go phunya kgotsa go bôrêga kwa tlase ka 50mm kabô ya tlalêlêtsô ya go tsengwa ga mokwatla wa ntlo wa galase ya faêbara.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

3. Go neetswe tshitshinyô ya gore se se latelang e nne minimamo wa boêmo jwa materiale o o dirisiwang go tlhoma galase ya faêbara ya go tsenya mokwatla.
4. Maikaelêlô ka kakaretso a resine a tlhoka ke motho yo a nang le bokgoni ba tirisô e e rileng.
5. Diteng tsa minimamo wa galase wa digerama tsa 600 go ya ka sekwêrêmetara.
6. Kabô ya minimamo wa galase mo resine e tshwanetse go nna 2:1.
7. Palotlasetlase ya 50mm ya go tsengwa ga mokwatla e tshwanetse go nna le boalô ba kokelêtsô ya galase ya digerama tsa 600.
8. Mothalô wa mokwatla o tshwanetse go nna ka tlhago e e leng gore fa e tsentswe, bogodimo jwa mokwatla bo lekana ka go tsetsepa godimo ga pala ya mokwatla.
9. Resine ya minimamo wa FR202 o tshwanetse go dirisiwa fa go tlhomiwa go tsengwa ga mokwatla yo nyenyefatsang molelô.

MEKWATLA YA NTLO YA MOTLHABA LE SAMÊNTÊ

Kapi ya mokwatla e tshwanetse go nna 40 mm (minimamo) kapi ya motlhaba-samêntê se se kima (karolo nngwe ya samente se se tlwaelegileng le dikarolo tse di nne tsa motlhaba), e lêlêfatsa ka bonnye ba 750 mm go tloga mo mokwatla go ya kwa tlase ka letlhakore le nngwe le le nngwe la borulêlô jwa bojang, go adilwe boalô jwa lethla la poliyolefêne ka bongwe, go tlaleditswe ka tshipi ya lobalêlô la galabone kgotsa terata ya lerofana ya galabone, ka sekhurumelô sa lobalêlô le le seng nnye go 20 mm mme e na le sebopegô le bokima jo bo maleba mo mokwatleng jaaka go bontsha mo setshwantshông 2.

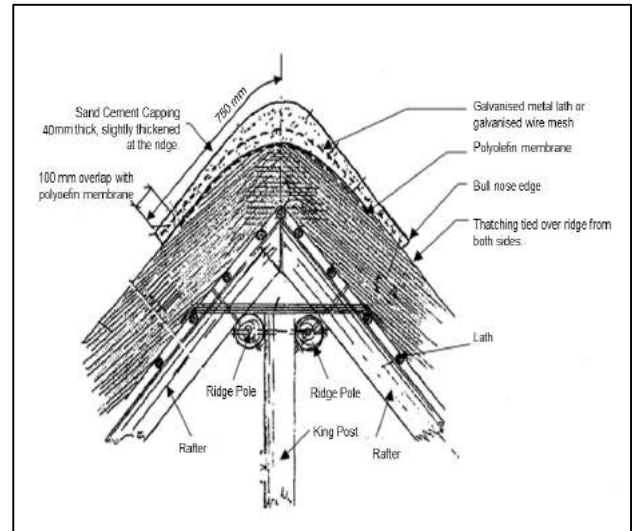
Go fetana ga ditomaganyô tsa lethla la poliyolefêne ga wa tshwanela go nna nnye go 200 mm.

Materiale wa mekwatla ya motlhaba-samente o tla tshwanela ke go tshola:

1. Samente sa go tlwaelega se se dumelanang SANS 50197-1;
2. Motlhaba o dumelanang le ditlhokegô tse di maleba tsa SANS 1083;
3. Terata ya lerofana ya galabone ka bokima jo bo seng nnye go 0,8 mm mme le pulêgô e sa feteng 25 mm;
4. Letha tsa poliyolefêne tsa bokima jo bo seng nnye go 250mm.

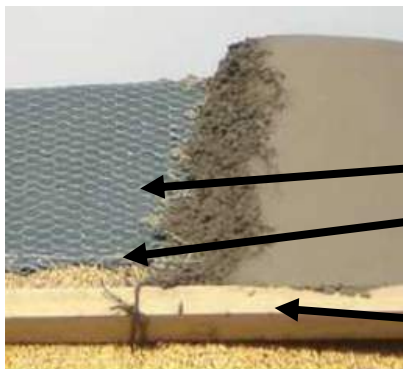
KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

- Kapi ya motlhaba, samente ka bokima jwa 40mm, se se dirlweng ka bokima jo bonnye jwa mokwatla (Sand Cement Capping 40mm thick, slightly thickened at the ridge)
- Lobalêlô lwa tshipi ya kalabone kgotsa lobalêlô lwa terata ya sefo ennye (Galvanised metal lath or galvanised wire mesh)
- Letha la poliyofênê go fetana ka 100mm (Polyolefin membrane)
- Letha la peeled ya nkô-bokgomo (Bull nose edge)
- Go tsengwa ga borulêlô godimo ga mekwatla, go tloga kwa matlhakoreng (Thatching tied over ridge from both sides)
- Lobalêlô (Lath)
- Pala ya Mokwatla (Ridge Pole)
- Tlhomeso (Rafter)
- Kotana e kgolo ya go rwala marulêlô (King Post)



Go tsengwa ga dikapi go tshwanetse go lêlêfatswa go ya kwa tlase go fitlhela bokhutlo kwa morago. (Ntlha e ga e tsepêle marulêlô a bojang ka Matlhaka a Kapa)

Êlatlhokô Meralô e e bodileng e e tshwailweng ka bohiibidu.



Konkereiti e tshwanetse gore ka dinako tsoitlhe e khurumetse bokhutlo kwa morago ka nako tsoitlhe. Babalêla bokima jo bo seng nnye go 40mm godimo ga mokwatla otlhe. Sefoterata ya Terata ya polasetiki ya maekorône ya 250. 100mm katolosô magareng ga go tswala setswalô kgotsa tshimololô ya polasetiki

Motsako wa Môtara: dikeriba tse 2 tsa motlhaba konkereiti go kgetse e nngwe ya Samente. Kabo 4:1

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Ya phôsô



E e tlhagaletseng sentlê



Bôalô jwa go nusetswa sa lobalêlô pele ga go baya kapi ya mokwatla.

Kapi ya mokwatla ya go nepagala e e kwa tlase. Lemoga sekhutlo sa go leba kwa godimo go tshologa metsi.



Borulêlô jwa bojang godimo ga dikapi tsa mo tlase tse di seng bonnye go 150 mm.

GO TSENYA KA KAKARÊTSÔ

GO TSENYA TSEKEDIMA

Tsekedima gantsi ntsi e tliša poêlô ya dikgaolô tša bothata jwa sethibelametsi. Dipopêgô tse di tsênêlêlang ka mo borulêlông di tshwanetse go thiboga ka pheletso ya bokgakala jo bo kgonagalang.



Tsela e e nepagetseng ya go tšenya ditsekedima ka go segelela ka mo lebotaneng le go dirisa selekhounu go tšwalêla bojang jwa se nusetswa ka mo tlase ga tsekedima ka tekanyetso ya bokima jwa 10mm le go lekana 200 mm ya bojang jwa borulêlô jwa bojang godimo ga tsekedima.

GO TSENYA SEFO E NNYE YA DIMONYANE



Tsela ya go nepagala ya go lekantšha sefo e nnye ya dinonyane ya di baboono (saêse ya minimamo wa mesima: 25 mm) Sefo e nnye ya dinonyane e lekantšhitswe ka go dikologa morokô wa 'voetlaag' ka go dikologa kotana ya ntlha ka terata ya galabone.

GO TSENYA LEFÊSETERE KWA GODIMO

Lefêsetere la ntlo ya borobalô le tshwanetse go agiwa ka minimamo ya di dekeri tse 30. Mafasetere a ntlo ya borobalô, a tlhômetseng ka mo thulamong ya borulêlô, le mafasetere a "dintshi" mo kगतong ya mathudi, ka makesimamo wa bothata jo bo thibogêlang. Di na le lebatla lwa mpheetlane ka go se fetoge go gaisa borulêlô jo bo saletseng, gore borulêlô jwa bojang jo bo godimo ga tsone bo bôle ka selekanyoka bonako jo bo feteletseng.

Go tsengwa gongwe le gongwe kwa tlase ga dekeri tse 45 bo tla nna le go babalêlwa tōta go feta borulêlô jwa dekeri tse 45 kgotsa go feta.



Go tsengwa ga mafasetere a ntlo ya borobalô a a siameng.

MEKORO YA LEPÔKÔSÔ

Go a tlhokega gore go seke ga nna le megorogoro ya go ntsha metsi a pula fa godimo ga mojakô wa kwa pele.



Lepôkôsô la mokoro la tshipi le diretswe go lekanya kgaolo ya bothata godimo ga mojakô wa mo pele mme e fitlhilwe ka go dirisa dipala le lobalêlô.

SEKA BORULÊLÔ JWA BOJANG

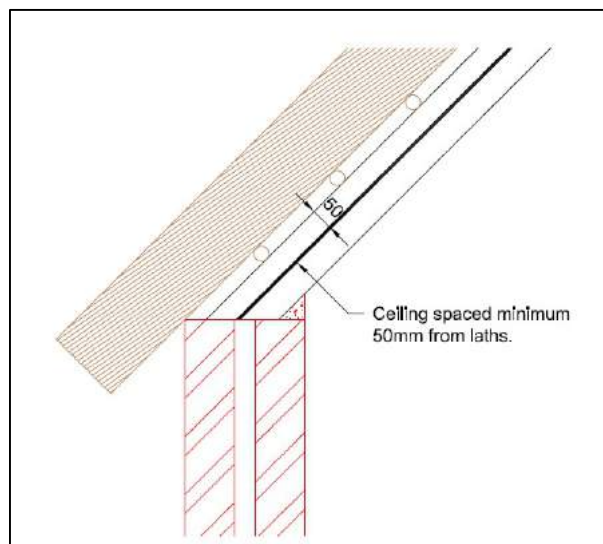
Dikagô tsa bogologolo tse di sa kgatlhiseng di ka neelwa tsholetso ya sefatlhegô ka go aga seka borulêlô jwa bojang. Dikagô tse di bokopa le go se kgatlhise, di ka oketswa ka seka sa borulêlô jwa bojang.



Setswantsho se se tshwantshitswe mo matsenong a bodirêlô jwa hotêlê, se bontsha borulêlô jo bo leng teng jwa tshipi mo e tshwanetseng go ba teng. Êlatlhôkô tebo ya asetetiki ya kagô.

DISILENG KA MO MARULÊLÔNG A BOJANG

Fa o dirisa sileng borulêlô jwa bojang katoloso ya 50mm a lobalêlô le sileng. Se se letlêlêla katoloso e e lekaneng ya "go hema" go thibogela phokafalô.

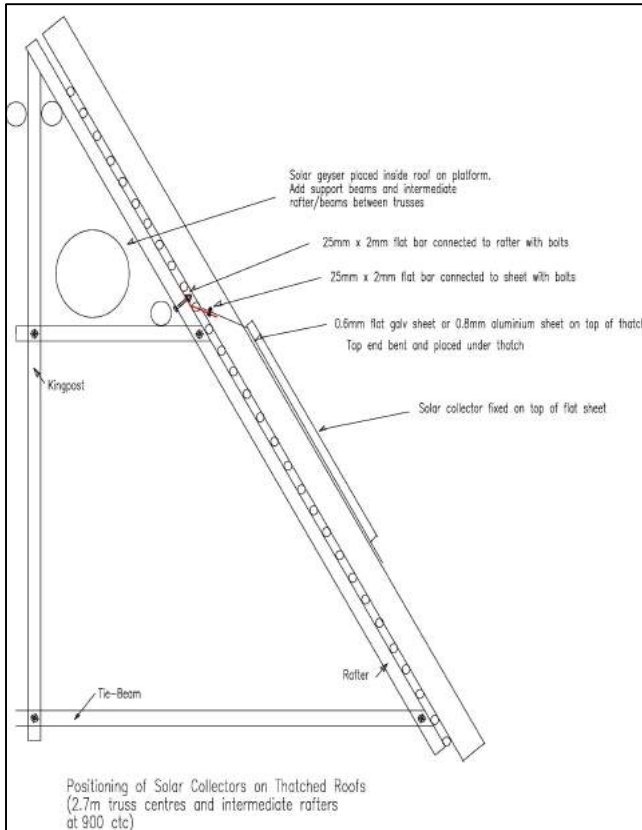


- Katolosô ya sileng ka minimamo wa 50mm go tswa mo lobalêlô (Ceilin spaced minimum 50 mm from laths)

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

GO TSENGWA GA KISARA

Sethalo se se kwa tlase ke kaedi ya go bontsha gore dikisara tsa solara le dikisara di tsengwa jaang godimo ga borulêlô jwa bojang.



- Kisara ya solara e e beilweng ka mogare ga borulêlô mo bofologêlô

Solar geyser placed inside roof platform

- Oketsa ka ditshegetsi tsa mesopori le ditlhomoso Mogare ga difata

Add support beams and intermediate rafter / beams between trusses

-25mm x 2mm bara e e bophaphati e e kgolaganeng le tlhomoso ka dipakêla

25mm x 2 mm flat bar connected to rafter with bolts

-Letsela la 0.6mm kgotsa 0.8mm ya letsela la kalabone la aluminiamo godimo ga borulêlô jwa bojang mme kwa bokhutlông jo bo kwa godimo jo bo katelegileng mme bo beilwe ka motlase ga borulêlô.

0.6mm flat galv sheet or 0.6mm aluminium sheet on top of thatch top end bent and placed under thatch

-Moputhi wa solara o o tiisang godimo ga letsela la bophaphati

Solar collector fixed on top of flat sheet

-Kotana e kgolo ya go rwala marulêlô

Kingpost

-Boêmo jwa moputhi wa solara mo borulêlô jwa bojang

Positioning of solar collectors on Thatched Roofs

{2.7m ya bogare jwa difata le ditlhomoso tsa ditlhomoso ka 900 jl.}

{2.7m truss centres and intermediate rafters at 900 etc.}

SETSHA SA POLOKÊGÔ

Mongwe le mongwe yo a dirang mo borulêlông o tshwanetse go apara ditweega tsa polokêgô ka nako tsothe. Setsha sa polokêgô se tshwanetse go sala morago polokêgô ya setsha le kagô le ditlhokegô tsa tshireletso.



Go siama, ka ditweega tsa polokêgô



Ka phosô, kwa ntle ga ditweega tsa polokêgô

TLHOKOMELO LE BODIRÊLÔ JWA
BORULÊLÔ JWA
BOJANG

Mokgathô wa Borurêlô jwa Bojang mo Aforika Borwa (TASA) , o gakolola ka matla gore go tlhomamisiwe fela borankonteraka ba bokgoni le tlwaelô, go tsenya le go dirêla marulêlô a bojang. Tsamaiso ya go goga & go kama e tshwanetse go lebêlêlwa sentle ka gore baagi ba marulêlô a bojang ba ba senang bokgoni, kitso le tshedimosetsô, ba ka tsaya ditsela tsa go tlabaganyetsa tse di ka senyang borulêlô la bofelo.

Dikhamphani tsa inšorensense di kopa gore tlhokomelô e tshwanetse go diriwa kgapetsa kgapetsa mo borulêlông. Potsô e e tlhagelela jaaka re solofêla gore go tla tlhokomelwa borulêlô. Gontse go na le kganetsanyô ka modirô wa go fêla le go kama. Ka gore go na le mefuta e mebedi ya marulêlô a bojang, gotwe matlhaka kgotsa bojang. A go na le molao wa gauta o riling, le gore tlhokomelo e tshwanetse go diragala ka dibaka dife? Gompieno ditsela tse dintsi tsa mefuta, di fokotsa tsamao ya botshelo jwa borulêlô.

Ka tlhokomelô e ntlê mo dibakeng tse di tlhokagalang, borulêlô jwa bojang jo bo agilweng sentlê bo tshwanetse go nna le tsamao ya botshelo jo boleele.

Kwa ntle ga go tlosa digagabi le dijalo tse dingwe mo bogodimo jwa bojang, tlhokomelo ya borulêlô jwa bojang e tshwanetse go nna teng. Gantsi tshenyego e bonagala go tswa mo tlhagelêlông ya khurumetso.

Ditlhatlhobô tsa borulêlô mo dikgaolong tse rileng jaaka megorogoro, dikgaolo kwa tlase ga ditlhare le dikgaolo tsa dithulamo kwa tlase ga 45°, di tshwanetse go tswaledisa ka nako tsotlhe go tlhoma boêmo jwa boalô jwa borulêlô jwa bojang. Ka kakaretso, reiti ya tatlhêgô ya bokima e ka tsewa go ya ka taolo ya 20 mm go fitlhela 25 mm ka khurumetso godimo ga dingwaga tse di supa go fitlhela dingwaga tse di robonngwe. Ka boalô jwa borulêlô jwa bojang jo bokima jwa 175 mm, sokasoka ya borulêlô jwa bojang e tla tlhomelwa mogare ga boalô (ka 80-100 mm kwa tlase ga bogodimo) ka gore sokasoka e be bile go bonalasega morago ga dingwaga tse 20 kgotsa go feta.

Tsamaiso ya botshelo e tla tswelletsatsa ke ditlhatlhobo tsa nako tsotlhe tse di supetsang fa go Goga & go Kama ka tlhokegô, ka garawe (legate).

Tshwanetse mongwe a tlhologanye dintlha tsa thekeniki ya borulêlô jwa bojang, pele a ka letlêlêlwa ka bonolo gore moagi o senang borutegi a kame borulêlô.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Kwa ntle ga go dira sentle, tsamaiso nngwe le nngwe ya go kama e ka fokotsa khurumetso godimo ga tshunuka, ka mantswe a mangwe bokima jwa modiro wa borulêlô ka jalo le tsamaiso ya botshelo.

Tiragalo ya ntlha e e tsewang, ke go thatlhoba ka kakaretso boleele jwa bojang kgotsa letlhaka. Fa go ka fitlhêla gore ke boleele jo bo lekaneng, mealô ya borulêlô jwa bojang e ka kgona go gogelwa kwa tlase. Seêmo sa borulêlô se bothokwa tôta, ka gore boleele jwa kutu kwa tlase ga sokasoka, bo na le go tsala ka patikô tsamaiso ya botshelo jwa borulêlô jwa bojang. Ka go latela, pofêlêlô ya go sokasoka e tshwanetse go bofêlêlwa ka mo botlase jwa borulêlô mme ka nako fela, tsamaiso ya go kama e ka simolola. Bona ditshwantsho kwa tlase.



Fa go lebelêlwa setshwantso kwa godimo mongwe a ka bona gore karolô ya bogodimo ya letlhakore la molema e santse e tlhoka go direlwa mme kwa tlase ka mealô e e gogetsweng kwa morago.



Go gagamala ga sokasoka morago ga go gogela boalô jo bo kwa ntle jwa ditshobokô kwa tlase

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Setshwantsho se se bontshang sentlê gore borulêlô jwa bojang bo phagamisitswe jaang morago ga bodirelô.



DIPAAKANYÔ KGOTSA
TLHOMAMISÔ YA BORULÊLÔ JWA
BOJANG

(Tse di latelang ga di tsepêge mo Marulêlô Jwa Matlhaka a Kapa, gagwa tshwanela go nna le boalô jwa bobedi jo bo okeditsweng mo meagong ya borulêlô jwa Matlhaka a Kapa.)

Materiale botlhe jwa go bôla jwa borulêlô jwa bojang bo tshwanetse go kgakgamololwa ka bojotlhe kwa ntle fa e le ka nako ya pabalêlô mme e êmisetswa ka materiale o montšha, ka pitlagano le gagamalô ya materiale wa go butswa. Borulêlô botlhe bo tshwanetse go tlošwa materiale wa go golosega ka go fêêla pele go ka bewa boalô jo bongwe le bongwe jo bontšha jwa borulêlô jwa bojang.

Mothalo wa botsô jwa sebopegô sa borulêlô bo tshwanetse go lekanya ka go kgona go tsaya morwalô wa kokelêtsô ya boalô jwa bobedi jwa borulêlô. GO BOTLHOKWA GO TLHATLHOKWA BOITEKANÊLO JWA SEBOPÊGÔ SA KOTA SA GO TSHOLA MORWALO WA KOKELÊTSÔ YA BOALÔ JWA BOBEDI PELE BO KA OKETSWA.

Go apesa sekhurumetsô sa borulêlô jwa bojang (kokelêtsô ya boalô jo bontšha godimo ga boalô jwa botsô) go nna tlhokego tôta fa go bôla go fitlhêla kgato e e leng gore dipaakanyô di tlhagelêla mo bogodimo.

Fa dipaakanyô di tlhagelêla, metsi a pula a ka eledisa kwa tlase go sutlha borulêlô jwa bojang ka go siana le go fologa mo morokông wa sokasoka le go tsena ka mo boalông jwa borulêlô jwa bojang le go tsena ka mo boagong. Thlagisô ya dipaakanyô e tla ka pholô ya bosena morokô ba sokasoka mme le go koafala ga sekhurumelô sa borulêlô botlhe fa tumalanô ya borulêlô jwa bojang e latlhega. Ka gore borulêlô jwa bojang ke materiale wa thago, e tla koafala ka reiti e e neetsweng, e ikanya ka maêmo a tikologô mo kgaolong.

Bokima jwa boalô jwa bobedi, bo bidiwa manêga kgotsa bipa borulêlô jwa bojang, go ya ka tafola 2 (bona dikholômo 2, 3 le 5 tafola 2 ka mo SANS 10407:2015 Kgatisô 2) Ntlha e botlhokwa go feta, ke sekhurumelô godimo ga tshunuka bo seke ba nna go feta bonnye jwa 70 mm.

Fa boalô jwa bobedi bo ka fitlhêlwa, bo tla tlošwa pele ga manêga kgotsa ga bipiwa ga borulêlô jwa bojang jo bo bewang (sk. go ka se tswile go nna le mealô e mebedi ya borulêlô jwa bojang mo sebopegô sa borulêlô).

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



Go botlhokwa go segela kwa moragodithare le ditlhatshana tse di okamametseng borulêlô jwa bojang, go netefatsa gore moriti o seke wa wela mo borulêlông gape o seke wa tlhola go bôla. Dikala tse di gaufi le gaufi tôta kgotsa di kgoma borulêlô, di tla senya borulêlô jwa bojang fa phefô e futswela. Ka go nna le borulêlô jo bo senang dikala, go tla oketsa tsamaiso ya botshelo jwa borulêlô.



POLOKEGÔ YA MOLELÔ

BOKGAKALA JWA POLOKELO

Polokêlô e e kgakala go tloga kwa dipopêgông le meelwane jaaka SANS 10400-T

4.12.2 Marulêlô a bojang

4.12.2.1 Bokgakala jwa polokêlô bo tswa kwa 4.2 ka jalo bo tshwanetse go ya ka ditlase tsa bonnô jo bo neetsweng mo tafola 2, ka motheo wa morwalo wa molêlô o kwa godimo mo borulêlông jwa bojang jo bo sa sirêlêtsegang le bolengpalo, A. Ka mo fomola bo tla ya ka kgaolo ya bokafapele jwa kagô jo bo lebileng molelwane, kwa ntle ga temogo ya mofuta wa lebota kgota dipulô gape le go akaretsa borulêlô. Mo borulêlô jwa bojang jo bo abelwang ka thulaganyô ya go timamolelô, e e dirilweng di teko go ya ka ASTM E108. Bokgakala jwa polokêlô bo tla ya ka merwalô ya meelô e e latelang,

- a) Dipholô tsa Teko ya A – morwalô wa molelô o monnye
- b) Dipholô tsa Teko ya B – morwalô wa molelô o mo magareng
- c) Dipholô tsa Teko ya C – morwalô wa molelô o kwa godimo

ÊLATLHOKÔ: A dipholô tsa teko ya C di lekana le borulêlô jo bo sa sireletswang.

4.12.2.2 Kwa ntle ga temogo ya ditlhokegô tsa 4.12.1, lapara ya borulêlô jwa bojang jo bo senang kgaolo ya thulaganyo ya borulêlô jo bonnye jwa 20 m², e e emeletseng ka go golosega gape e sa kgomaganya le boago jo bongwe, e tla tshwanela ke go se tlhomelwa gaufi le

- a) 1,0 m go molelwane, le
- b) Bokgakala jwa polokegô jo bo tswang mo boago bongwe le bongwe 4.2, fa e se boago jwa maje jo bo tlhomilweng kgotsa lebota la konkereiti le le na leng go feta fetana ga bogolo jwa 0,3 m godimo ga mola wa mo tlase ga borulêlô jo bo okeleditsweng ka bonnye jwa 1,0 m jo bo tsosolodiwa mo letlhakore ngwe le ngwe lwa lapara.

4.12.2.3 Motho wa bokgoni (moenjenêrê wa molêlô) o tshwanetse go dira tshekatsheko e e rašenale go ikaêlêla go dumelana ga kagô ya borulêlô jwa bojang jo bo tlhomilwang kgatlhanong le kagô e e leng teng.

4.12.2.4 Dikagô le dilapara tsa borulêlô jwa bojang di na le polane ya kgaolo e kgolo go feta 300 m² kgotsa e e gaufi le bogolo jwa 4,5 m go molelwane mongwe le

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

mongwe le bokgakala jwa polokegô go tswa mo kagô e e leng teng 4.2, e e tshwanetseng go abelwa ka kokelêtsô ya dithulaganyô tsa go tima molelô tsa kakanyetsô tsa thulagano ya borulêlô ka sebele e e dirisiwang mme e babalêla jaaka totobetsô ya mmopi wa dithulagano.

4.12.2.5 Dikagô le dilapara tsa borulêlô jwa bojang mo dikgaolong tsa kitlanô ya bebenya ya legadima e e kgolo go feta 7 (bona SANS 10313) e tla abelwa ka thulaganyô ya tshireletso ya legadima (LPS) e thadilweng le go tsengwa ke batho ba bokgoni go ya ka ditlhokegô tse di maleba tsa SANS 10313 le SANS 62305-3.

4.12.2.6 Dikagô le dilapara tsa diphetesi (ditshunuka tsa terata) di mo boalông jwa borulêlô jwa bojang jo bo dirisiwang, mo dikgaolong tsa kitlanô ya bebenya ya legadima go feta 3 (bona SANS 10313), di abelwa ka thulaganyô ya tshirêlêtsô ya legadima, e thadilweng le go tsengwa ke batho ba bokgoni go ya ka ditlhokegô tsa SANS 10313 le SANS 62305-3.

DITIRÊGÔ

Theleso ya matla a motlakase le megala ya thêlêfone e tshwanetse go tsena ka diphetesi ka fa tlase ga lefatshe. Go tsenya gotlhe ga diterata tsa motlhakase ka mo phatlheng ya borulêlô go tshwanetse go dirisa diphetesi tsa go khurumetswa ka polasetiki le ka mapôkôsô a makopanêlô a a tswaletseng sentlê.

TIRISÔ YA DIPHETESI

Go nna teng ga ditshipi kgotsa mofuta mongwe le mongwe wa phetesi mo sebopegông sa borulêlô go tlhola kotsi ya phetesilegadima fa borulêlô bo sa sirêlêtswa. Ka gone go botlhokwa gore ditaolo tsa SANS di salwe morago ka tlhoafalo go thibela tshenyô ya legadima.

Diphaepe, megala kgotsa diterata tsa motlakase ga di a tshwanela go nna mo di kgomanang ka go lolama le borulêlô jwa bojang. Ditirêgô tsa motlakase tse dingwe (telefounu le thelêbišene) ditshwanetse go tsena kago mo kगतong ya mogatshe ka nako tsotlhe . Ga wa tshwanela go nna le megala kgotsa diterata tse di tsamayang ka mo borulêlông jwa bojang.



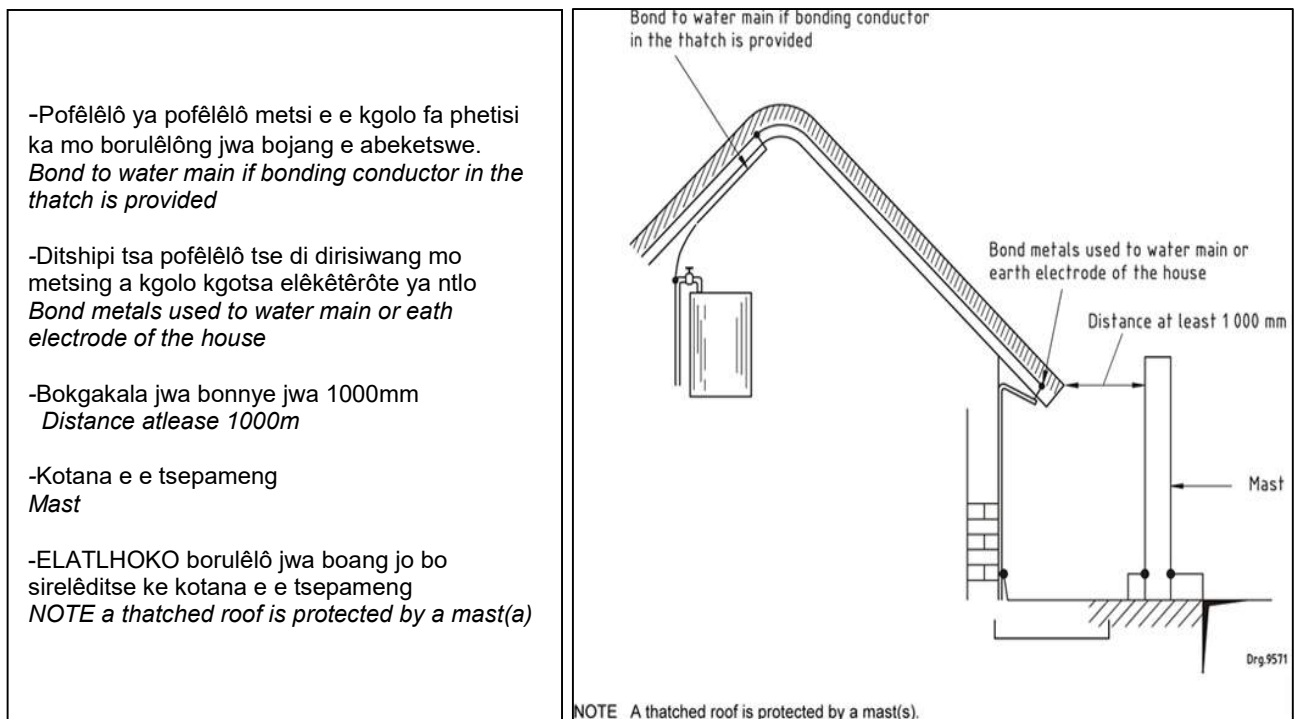
Diphetesi tsa legadima ka bontsi

THULAGANYÔ YA TSHIRÊLÊTSÔ YA LEGADIMA (LPS)

Refêrense ya polokêgô ya molelô, SANS 10400-T. Go botlhokwa tota go netefatsa gore sethalo le go tsengwa ga borulêlô go sala morago ditaolo tsa LPS.

Ka bonnye jwa tshirêlêtsô kgato III (bona SANS 62305-3) e tla bewa mo kgetseng ya dipopêgô tsa borulêlô jwa bojang. Fa go ka dirisiwa masête ya tshipi jaaka LPS, e tla thadiwa go ya ka SANS 10225. Tshirêlêtsô e tla baakangwa ke mongwe kgotsa bangwe ba go tlhomiwa ka go golosega ka masête. Kgaolo ya tshirêlêtsô ya dimasête e akaretsa dikhutlô tsa di kabôle, dintshamosi, diantenara, diphaepe tsa mowa le dilo tsa tshipi tse dingwe le tse dingwe. Diterata tsa thelefone, ditirêgô tsa dikopanyô tsa theleso ya motlakase kgotsa ditshipi dingwe tsa kwa godimo kgotsa diphaepe ga di a tshwanela go tsena sebopegô ka mogare kgotsa gaufi le borulêlô jwa bojang. Bokgakala go tswa mo masête go fitlhela borulêlô jwa bojang jo bo sa tshwanelang go nna gonnye go 1 000 mm.

Ditshipi tse di diritsweng mo kagông ya borulêlô jwa bojang di tla tshwanela ke go bofêlêlwa le go gatelelwa fa fatshe. Diphaepe tsa metsi, diphaepe tsa mowa, ditanka, diphaepe tsa gase, megala ya thelefone le setsidima, dialamo tsa tshirêlêtsô le diterata tsa motlakase le phetesô ka mogare ka 1 000 mm ga borulêlô jwa bojang bo tla fimelwa, bofêlêlwa le go gatelelwa fa fatshe go ya ka SANS 10142-1.



KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

KITLANÔ YA LEGADIMA FA FATSHE N_g

Tafola ya C.1 — Lightning ground flash density Megala e e laolang kgonagalô ya go otlà ke legadima

1	2	3	4	5	6
Toropo	N_g	Toropo	N_g	Toropo	N_g
Aberdeen	1,8	Gobabis	2,6	Paarl	0,2
Albertinia	0,5	Golden Gate	6,4	Petrus Steyn	4,4
Alexandria	0,8	Grabouw	0,2	Pietermaritzburg	7,0
Aliwal North	5,3	Graaff-Reinet	2,5	Piet Retief	11,7
Aranos	1,6	Grahamstown	1,4	Piketberg	0,2
Aroab	1,7	Greytown	5,5	Polokwane (Pietersburg)	3,6
Barberton	7,5	Groblersdal	5,1	Pongola	6,3
Beaufort West	1,7	Harding	5,5	Port Alfred	1,4
Belfast	7,3	Harrismith	9,4	Port Elizabeth	0,9
Bela Bela	7,5	Heidelberg (WC)	8,0	Potchefstroom	7,0
Benoni	7,5	Heilbron	5,8	Pretoria	7,5
Bergville	6,3	Hermanus	0,1	Prieska	3,0
Bethal	8,6	Hluhluwe	6,0	Prince Albert	0,6

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Bethlehem	6,4	Hoedspruit	2,8	Queenstown	5,2
Bethulie	3,3	Humansdorp	1,1	Reddersburg	6,4
Bloemfontein	5,2	Irene	7,2	Richards Bay	5,2
Bloemhof	4,8	Jagersfontein	2,2	Richmond (KZN)	8,0
Blyderivierspoort	4,5	Johannesburg	7,5	Riversdale	0,2
Boksburg	7,5	Jozini	5,6	Roedtan	4,9
Brakpan	7,5	Keetmanshoop	1,2	Rustenburg	8,1
Brandvlei	0,9	Kempton Park	7,5	Sabie	3,2
Brits	8,0	Keiskammahoek	2,0	Satara	1,5
Bultfontein	3,6	Kimberley	4,8	Schweizer-Reneke	5,6
Burgersdorp	3,3	King William's Town	1,1	Scottburgh	3,0
Butterworth	0,9	Klerksdorp	7,0	Senekal	4,7
Cala	5,2	Knysna	0,4	Sishen	3,4
Caledon	0,2	Komatipoort	2,6	Skukuza	2,3
Calvinia	0,7	Kroonstad	5,8	Somerset East	0,8
Cape Town	0,3	Krugersdorp	7,0	Springbok	0,6
Carletonville	7,5	Kuruman	3,0	Springs	7,5
Carnarvon	1,1	Ladybrand	5,4	Standerton	7,6
Carolina	9,0	Ladismith (WC)	0,7	Stanger	3,5

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Cathcart	1,6	Ladysmith (KZN)	9,0	Stellenbosch	0,3
Cedara	8,0	Laingsburg	0,6	Steytlerville	1,7
Ceres	0,2	Lichtenburg	5,5	Sutherland	0,9
Christiana	6,4	Loskop	4,3	Swakopmund	0,5
Colenso	7,8	Lüderitz	0,4	Tarkastad	3,4
Colesberg	3,0	Lydenburg	5,0	Thabazimbi	2,1
Cradock	5,8	Machadodorp	8,7	Theunissen	5,2
De Aar	2,5	Mafikeng	5,6	Touws River	0,3
Delareyville	5,4	Makhado	1,5	Tsumeb	4,0
Donnybrook	8,5	Malmesbury	0,1	Tzaneen	4,1
Doornfontein	7,3	Mandini	3,4	Umtata	3,0
Dordrecht	2,6	Margate	1,8	Uniondale	0,6
Douglas	4,0	Marikana	6,9	Uppington	2,2
Dundee	9,2	Matatiele	6,6	Utrecht	9,0
Durban	4,4	Middelburg (EC)	3,3	Ventersdorp	5,6
East London	1,6	Middelburg (Mpumalanga)	4,6	Vereeniging	7,5
Edenvale	5,6	Modimolle	7,0	Victoria West	1,4
Elliott	4,2	Mokopane	3,4	Villiersdorp	0,4

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Empangeni	4,1	Molteno	1,6	Vredendal	0,2
Ermelo	9,0	Montagu	0,2	Vryburg	3,0
Eshowe	5,3	Mooi River	6,9	Vryheid	8,9
Evander	8,5	Mookgopong	6,0	Walvis Bay	0,2
Flagstaff	4,9	Mossel Bay	0,5	Welkom	5,0
Fort Beaufort	1,4	Murraysburg	1,9	Willowmore	1,5
Fraserburg	1,3	Nelspruit	2,7	Windhoek	2,3
George	1,5	Nossop	2,2	Witbank	7,5
Georgedale	5,6	Noupoort	7,4	Zeerust	4,2
Germiston	7,5	Ohrigstad	4,2		
Giant's Castle	13,0	Oshakati	2,3		
Gobabes	0,2	Oudtshoorn	0,5		

Raporotô ya LPS ya polokegô le tsenyô e tla neela ke motho o rutegileng.

Setifekeiti sa LPS sa pabalêlô le tsenyô se tla neela ke motho o rutegileng.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Amdt 1

1. Location												
Physical address:												
Name of building:												
Erf/Lot No.:					Suburb/Township:							
District/Town/City					Province:							
Type of inspection:		Repeat <input type="checkbox"/>			Additional <input type="checkbox"/>			Visual <input type="checkbox"/>				
Acceptance <input type="checkbox"/>		Design <input type="checkbox"/>			During construction <input type="checkbox"/>							
Lightning ground flash density (N_g): (Flashes/km ² /year)				Accepted annual frequency of lightning flashes to structure (N_c):								
Protected space (description):												
Risk assessment done for system?		Yes <input type="checkbox"/>		No <input type="checkbox"/>		Risk assessment report attached?		Yes <input type="checkbox"/>		No <input type="checkbox"/>		
2. Risk assessment												
User-specified acceptable risk				User-calculated risks:			Risk of direct strike R_D	Risk of indirect strike R_I	Calculated risk R			
Tolerance on risk: R_T	1	Loss of human life					10 ⁻³	1				
	2	Loss of services					10 ⁻³	2				
	3	Loss of cultural heritage					10 ⁻³	3				
3. Air-termination system												
Thatched roof:		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Metal roof:		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Hazardous location: Yes <input type="checkbox"/>			No <input type="checkbox"/>	
Flat roof:		Yes <input type="checkbox"/>	No <input type="checkbox"/>									
LPS level:		I <input type="checkbox"/>		II <input type="checkbox"/>		III <input type="checkbox"/>		IV <input type="checkbox"/>				
Height of structure:			Height of mast/catenary:			Number of mast(s):						
Mast design in compliance with SANS 10225:				Supplier of mast:			Tel. No.:					
Air-termination system:				Protective angle α :			Rolling sphere radius, m:					
Material used:		Lead <input type="checkbox"/>	Steel (stainless or galvanized) <input type="checkbox"/>		Titanium <input type="checkbox"/>	Copper <input type="checkbox"/>	Aluminium <input type="checkbox"/>	Zinc <input type="checkbox"/>				
4. Down conductor system												
Material used:		Steel (stainless or galvanized) <input type="checkbox"/>		Copper <input type="checkbox"/>		Aluminium <input type="checkbox"/>		Spacing between conductors m				
Size of DTS conductor used, mm ²				Is existing structure used as down conductor?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Description:				
Reinforced concrete/metal used?		Yes <input type="checkbox"/>	No <input type="checkbox"/>									
Mesh design:		Number of down conductors:		Spacing between ring conductors:		Accessible joints/terminations:		Yes <input type="checkbox"/>	No <input type="checkbox"/>			
Accessible joints/terminations:				Pop-riveted <input type="checkbox"/>		Soldered <input type="checkbox"/>						
NOTE The following abbreviation has been used:												
DTS down conductor termination system												

Amdt 1

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Amdt 1

5. Earth-termination system			
Earthing arrangement	Type A	Type B	Particular conditions:
	Reason for earthing arrangement:		
Final equivalent earth resistance obtained:		Ω	Soil resistivity: Ωm
6. Lightning equipotential bonding			
Equipotential bonding bar installed:		Yes <input type="checkbox"/>	No <input type="checkbox"/>
System connected to bonding bar installed:	Telecommunication <input type="checkbox"/>	Pipes <input type="checkbox"/>	Electrical <input type="checkbox"/> Equipment <input type="checkbox"/>
Material used:	Steel (stainless or galvanized) <input type="checkbox"/>	Copper <input type="checkbox"/>	
Conductor size used to connect bonding bar to ETS, mm ² :		Conductor size used to connect metal installation to ETS, mm ² :	
7. Surge protective devices (SPDs)			
Design drawing No.:	Main incomer distribution board: Load current A		Prospective short-circuit current rating kA
SPD, class I: nominal a.c. voltage U_N V	Impulse current I_{imp} : kA (10/350 μs)	Max. back-up fuse current I_k kA	
	Voltage protection level at I_{imp} : kV	Follow current extinguishing capability: kA _{rms}	
SPD, class II: nominal a.c. voltage U_N V	Nominal discharge current I_n kA (8/20 μs)	Max. mains overcurrent protection A	
	Voltage protection level at I_n : V	Temporary overvoltage (TOV) U_T V/5 s	
8. Certification			
I/We, being the person(s) responsible for the design ^a , installation ^a , inspection ^a , testing ^a , of the lightning protection system (LPS), am/are competent to certify that the LPS complies with the requirements of SANS 10313.			
^a Delete where not applicable.			
9. Details of LPS designer			
Name:	ID No.:	Company:	
Tel No.:	Signature:	Date:	
10. Details of LPS installation installer			
Name:	ID No.:	Company:	
Tel No.:	Signature:	Date:	
11. Details of fixed electrical installation			
Any work performed on the fixed electrical installation with regard to the LPS shall be witnessed by an accredited person.			
Installation safety report No.:		Date of installation safety report:	
12. Approval signature			
Name of lightning protection inspector:		Company:	
Tel No.:		Date:	
ID No.:		Signature:	
NOTE The following abbreviations have been used:			
DTS down conductor termination system			
ETS earth-termination system			

Amdt 1

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Amdt 1

5. Earth-termination system			
Earthing arrangement	Type A	Type B	Particular conditions:
	Reason for earthing arrangement:		
Final equivalent earth resistance obtained:		Ω	Soil resistivity: Ωm
6. Lightning equipotential bonding			
Equipotential bonding bar installed:		Yes <input type="checkbox"/>	No <input type="checkbox"/>
System connected to bonding bar installed:	Telecommunication <input type="checkbox"/>	Pipes <input type="checkbox"/>	Electrical <input type="checkbox"/> Equipment <input type="checkbox"/>
Material used:	Steel (stainless or galvanized) <input type="checkbox"/>	Copper <input type="checkbox"/>	
Conductor size used to connect bonding bar to ETS, mm ² :		Conductor size used to connect metal installation to ETS, mm ² :	
7. Surge protective devices (SPDs)			
Design drawing No.:	Main incomer distribution board: Load current A		Prospective short-circuit current rating kA
SPD, class I: nominal a.c. voltage U_N V	Impulse current I_{imp} : kA (10/350 μs)		Max. back-up fuse current I_k kA
	Voltage protection level at I_{imp} : kV		Follow current extinguishing capability: kA _{rms}
SPD, class II: nominal a.c. voltage U_N V	Nominal discharge current I_n : kA (8/20 μs)		Max. mains overcurrent protection A
	Voltage protection level at I_n : V		Temporary overvoltage (TOV) U_T V/5 s
8. Certification			
I/We, being the person(s) responsible for the design ^a , installation ^a , inspection ^a , testing ^a , of the lightning protection system (LPS), am/are competent to certify that the LPS complies with the requirements of SANS 10313.			
^a Delete where not applicable.			
9. Details of LPS designer			
Name:	ID No.:	Company:	
Tel No.:	Signature:	Date:	
10. Details of LPS installation installer			
Name:	ID No.:	Company:	
Tel No.:	Signature:	Date:	
11. Details of fixed electrical installation			
Any work performed on the fixed electrical installation with regard to the LPS shall be witnessed by an accredited person.			
Installation safety report No.:		Date of installation safety report:	
12. Approval signature			
Name of lightning protection inspector:		Company:	
Tel No.:		Date:	
ID No.:		Signature:	
NOTE The following abbreviations have been used:			
DTS down conductor termination system			
ETS earth-termination system			

Amdt 1

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Amdt 1

1. Location			
Physical address:			
Name of building:			
Erf/Lot No.:		Suburb/Township:	
District/Town/City:		Province:	
LPS level:	I <input type="checkbox"/>	II <input type="checkbox"/>	III <input type="checkbox"/> IV <input type="checkbox"/>
			Date of last inspection:
Type of inspection:	Repeat <input type="checkbox"/>	Additional <input type="checkbox"/>	Visual <input type="checkbox"/> Acceptance <input type="checkbox"/>
2. Details of LPS installation installer			
Name:		ID No.:	Company:
Tel No.:		Signature:	Date of installation:
3. Details of fixed electrical installation			
Any work performed on the fixed electrical installation with regard to the LPS shall be accompanied by an Installation safety report issued by an accredited person.			
Original Installation safety report No.:		Date of Installation safety report:	
4. Maintenance of LPS structure			
4.1 Air-termination system (ATS)			
Connection between ATS and down conductor: Acceptable <input type="checkbox"/> Replaced <input type="checkbox"/> Refastened <input type="checkbox"/>			
Material used: Lead <input type="checkbox"/> Steel (stainless or galvanized) <input type="checkbox"/> Titanium <input type="checkbox"/> Copper <input type="checkbox"/> Aluminium <input type="checkbox"/> Zinc <input type="checkbox"/>			
Straightness of mast used: Acceptable: <input type="checkbox"/> Replaced <input type="checkbox"/>		Continuity of ATS:	
4.2 Down conductor system (DTS)			
Material used: Steel (stainless or galvanized) <input type="checkbox"/> Copper <input type="checkbox"/> Aluminium <input type="checkbox"/>			Electrical conductivity of conductors: Ω
Size of DTS conductors used, mm ² :		Accessible joints/terminations:	
Electrical conductivity of shielding measures: Ω		Electrical conductivity of equipotential bonding lines: Ω	
If reinforced concrete/metal parts are used as down conductors, is conductivity still present? Yes <input type="checkbox"/> No <input type="checkbox"/>			
4.3 Earth-termination system			
Earthing arrangement: Type A		Type B	Identification of earth connection points visible? Yes <input type="checkbox"/> No <input type="checkbox"/>
Equivalent earth resistance, Ω :		Soil resistivity, Ω .m:	Earth termination system visible: Yes <input type="checkbox"/> No <input type="checkbox"/>
Connection between DTS and ATS:		Connections acceptable <input type="checkbox"/>	Connections needed refastening ^a <input type="checkbox"/> Connections needed to be replaced ^a <input type="checkbox"/>
Safe dispersing of lightning current:		Yes <input type="checkbox"/>	No <input type="checkbox"/>
^a In the event of connections that were refastened or replaced, please provide a drawing that shows the locations of these connections.			

Amdt 1

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Amdt 1

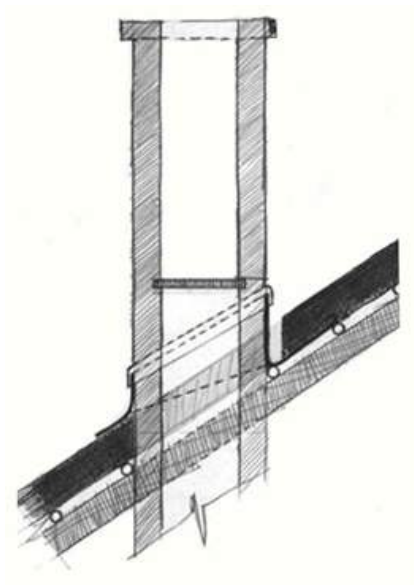
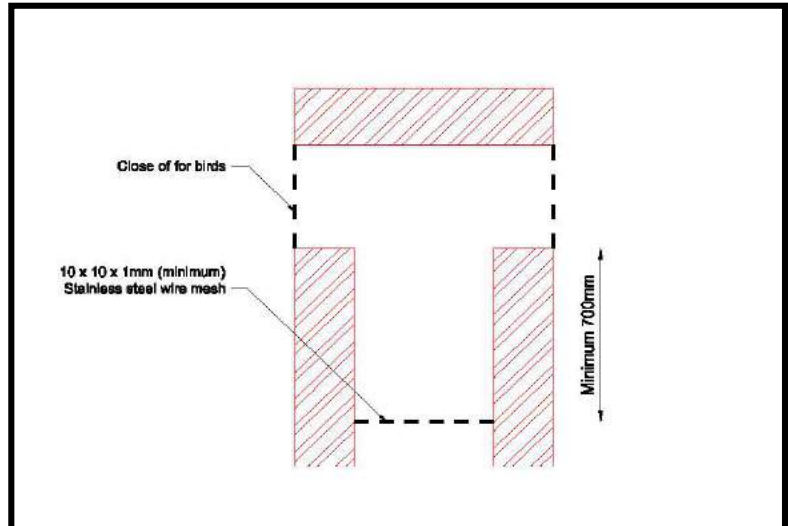
4.4 Lightning equipotential bonding			
Equipotential bonding bar inspected:		Acceptable <input type="checkbox"/>	Replaced ^b <input type="checkbox"/>
System connected to bonding bar:	Telecommunication <input type="checkbox"/>	Pipes <input type="checkbox"/>	Electrical <input type="checkbox"/> Equipment, describe:
Material used:	Steel (stainless or galvanized) <input type="checkbox"/>	Copper <input type="checkbox"/>	Connection between bonding bar, ETS and DTS: Acceptable <input type="checkbox"/> Repaired ^c <input type="checkbox"/>
Surge protective devices inspection:	Acceptable <input type="checkbox"/>	Damaged (reported to electrician) <input type="checkbox"/>	
Bonding of metal equipment checked:	Pipes <input type="checkbox"/>	Conduit <input type="checkbox"/>	Gutters <input type="checkbox"/> Roofs <input type="checkbox"/>
5. Approval signature			
Name of lightning protection inspector:		Company:	
Tel No.:		Date:	
ID No.:		Signature:	
NOTE The following abbreviations have been used:			
ATS air-termination systems			
DTS down conductor termination system			
ETS earth-termination system			
^b In the event of an equipotential bonding bar that was replaced, proof of correct installation and reconnection of equipment to the bonding bar shall be shown.			
^c In the event where the connection between the bonding bar, the ETS and the DTS was repaired, proof of the repair by accredited personnel shall be submitted.			

Amdt 1

DIKEMISÔ THANYA

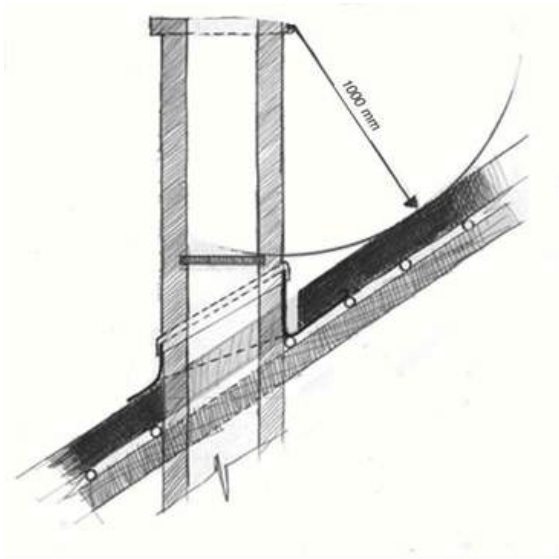
Kemisô thanya ke lerofana la tshipi e e senang dipatsô e e tse tsweng ka mo sentshamosing ka minimamo wa boteng jwa 700.

- Setswalela kwa ntle sa dinonyane
Close off ya dinonyane
- minimamo wa 10x10x1mm
Terata ya tshipi e e sa timpaleng ya lerofana
10x10x1mm (minimum) Stainless steel wire mesh
- Minimamo wa 700mm
Minimum 700mm



Boêmo jo bo tlwaelegileng ba Kemisô Thanya.

Gontse go gakololwa gore re nne le dintshamosi tse di phephafiditsweng/ di fêtswe lee ka nna gangwe mo ngwageng pele ga setlha sa mariga.



Karolo e e tlwaelegileng e e bontshang minmamo ya boleele ka sentshamosi godimo ga boalô jwa borulêlô jwa bojang, 1000 mm jaaka Ditaolo tsa Kagô tsa Setšhaba

DITHULAGANYÔ TSA SEKOLOBISA

Nngwe ya dilekanyô tsa go thibela meelô go anamisa magareng ga marulêlô a bojang ke tsenyô ya thulaganyô ya sekolobisa kwa bogodimo tota jwa borulêlô. Thulaganyô ya sekolobisa sa metsi e ilela metsi a lephôtôphôtô kwa godimo le kwa tlase mo borulêlông jo bo tlhageletseng mo tiragalông ya molelô. Legale se se ka se boloke setsha mo molelô o simololang, e ka thibela go anamisa ga molelô go tloga mo borulêlông bongwe go ya kwa borulêlô jo bongwe.

Go ka tsengwa thulaganyô ya diatla kgotsa ya go itirisa. Dithulaganyô tsa go itirisa, gantsi di akaretsa dikutlô-mosi tse di tsosolosang sekolobisa go tswa mo molelông ka mo gare ga bonnô. Mo dikgaolong tse e leng gore kगतêlêlô ya metsi ga ena matla a lekaneng dipômô di ka tsengwa kgotsa metsi a ka pompiwa go tswa kwa diphadiphadi tsa metsi.

DIKOBÔ TSA MOLELÔ

Kobô ya go timamolelô ke lesela la seromelwateng le le kgonang go lwantsha dithempêrêšhara tse kgolo go feta tirisô ya dikeri tsa sentikereiti ya 750. Lesela le le logilweng ka metlha le metlha go sutlha kgaolo ya borulêlô jwa bojang mme e khurmetswe gotlhe ka borulêlô jwa bojang, gone ga go bonagale. Go akangwa gore materiale wa pofêlêlô ya kalabonê o dirisiwe mo bonnong jwa sokasoka ya tere ya tlwaelô ya tukakgabo ka jalo ke diphatsa molelô.

Go dirisa kobô ya molelô mo borulêlông jwa bojang e elelwa tlhokô ke dikhamphani tsa inšorensense fa o balela dikarolotuelô tsa inšorensense.

BOLENG JWA ENEJI

Intasetari ya go tsenya borulêlô jwa bojang mo Aferika Borwa e gola ka bonakô jaaka re fitlhêla batho ka bontsi ba batla dithefosanô tsa tlhago tsa kagô. Ka gore le yone ke kumako ya borulêlô e leng ya tlhago ka botlalô, go tsengwa ga borulêlô jwa bojang go gola ka go ratega mo tikologông e maloko a setšhaba ka bontsi a sekamelang go ya kwa materialeng wa tlhago gore o dirisiwe mo dikagông, kgang e e itsege ka tlwaelo e le “mothalo botala”.

Borulêlô jwa bojang ke borulêlô jwa tlhagô jo bo gaisang marulêlô a mangwe ka go dirisa dikumako tsa tlhago mo borulêlông ka gore di kotutswe go tswa fa fatshe mme di diriwa kwa ntle ga ditsamaiso, go tlhama sekhumetsô sebele sa borulêlô. Ka bolengdipalo tsa thêmale tsa borulêlô jwa bojang, GA GONA tlhokêgô ya dikumako dingwe le dingwe go tlhama kamoganyô.

Ka go leba marulêlô ka leitlho la “botala” borulêlô jo bo molemô jo bo ka bewang mo kagong ke borulêlô jwa bojang. Sebopêgô se ke dipala tsa dikota tse di tshwarang CO2 ya kagô mme borulêlô jwa bojang jwa bonnete ke kumako ya tlhagô e tshwarang CO2 ka mosola o o okeditsweng. Boammaruri ke gore bojang jwa borulêlô jwa bojang bo diragalang ngwaga le ngwaga. Go solofediwa gore borulêlô jwa bojang bo tla tshela dingwaga di le dintsi ka nako e bontsi jwa CO2 e sa rebolwang.

Ka go dirisa borulêlô jwa bojang gone borulêlô bo thaletswe go dirisiwa jaanong mme le tirisôgape ya bokamoso. Go ikanya dikumakô tsa metswedi ya tlhokomelo le mo materialeng e fokoditse. Borulêlô jwa bojang bo tsalana le lefatshe ka materiale wa tirisôgape. Ke materiale wa selegae, wa khabone e e golosegileng mme ka go dirisa kumakô re tshegetska ka bonnete dikagô tsa go tsalana le lefatshe gape le go tshegetska theleso ya dimateriale tsa selegae.

Ka lobaka lwa tshenyego ya lefatshe, dipharologanyô tsa dithempêrêitšhara ka mo ditlheng di nna go feta gotlhe tota. Bontsi jwa dikumakô tsa kamoganyô bo tlišetswa mo mmarakeng kgapetsa kgapetsa empa borulêlô jwa bojang bo tšwelela pele bo le tharabolô ya tlhago le botsalano-lefatshe. Go ya ka asetetiki ke nngwe ya dikhutlô tsa kagô tsa go kgatlhisa go feta selekano. Ga gona kumakô nngwe e e nang le dipharologantsho jaaka kumakô tala. Ka Bolengdipalo tsa themalê tse kwa godimo, polokegô ya eneji e netefaditswe, phokotsô ya thitôfatsa le tsidifala ka tiragalo ya terama. Ka dipuo tsa go godisa ditlhwatlhwa le kgonagalô ya go timiwa ga metlakase, borulêlô jwa bojang bo na le dithulanô tse kgolo mo polokelông ya eneji.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Ditlhwatlhwa tse di kwa godimo tsa borulêlô jwa bojang di lekanyeditswe mo marulêlông a thaele ke tlhamane e e thagisitsweng mo diporojekeng tse malôba. Borulêlô jwa bojang bo supa go direga go feta dikhurumetsô tsa borulêlô ka ditlhwatlhwa tsa dilô tse di elwang tlhokô. Borulêlô jwa bojang bo tlhoka kamaganyô e e seng themalê, dithulaganyô mokoro, fasiase, mathudi, disileng, dipêntê, jl.jl. mme borulêlô jwa bojang bo abela kokêtsô ya phatlha ya sileng ka lebaka la go ya bogodimo jwa 45 dek, e neela moagô thaloganyo e e matla ya bolumu. Ka dilô tsotlhe tse di elwang tlhokô borulêlô jwa bojang ke nngwe ya ditlhôpô tsa tshomarelo ya khutlô ya borulêlô mo mmarakeng.

Go tsengwa ga borulêlô jwa bojang go dirisa dimateriale a kgonang go tsholwa ka tlhago sk. Bojang kgotsa letlhaka. Mo Aforika Borwa, gantsi go dirisiwa fela dijang tse di tlhologileng.

Go dirisa borulêlô jwa bojang gona le mesola e le mentsi bogolo go borulêlô jwa sesupo sa tlwaelo. Borulêlô jwa bojang ke kamaganyô ka tlhagô le bogodimo jwa borulêlô jwa 45 dek. Go na le ntlwana e e kwa godimo ya lobaka le le tona tota le le ka tlhamiwang. Bontsi jwa dimateriale tse dingwe ga di tlhokagale fa go dirisiwa borulêlô jwa bojang jaaka megoro, diphaepe tsa tswa kwa tlase, fasiase, mathudi, disileng, dimouta , go penta ga khutlôe ntseng jl.jl. Go ela tlhokô ga tsotlhe tse e dira gore boitshenkelo jwa borulêlô jwa bojang bo nne jo bo bonolo tota le koketso ya gore ka bonnete ke boitshenkelo gape le go boloka eneji. Ke lebaka tota la gore batho ba le bantsi ba itshenkela borulêlô jwa bojang. Karolo ya dipalelo tse di neetweng mmasepala ke tse moagiteke a dibalelang ka go akaretsa bontsi jwa dipalelo tsa dikgato tsa eneji.

Tlhamane nngwe ka borulêlô jwa bojang e e thagisitsweng kgapetsa kgapetsa ke tlhwatlhwa ya inšorensense. Ka ditsela tse dintsi tsa go kopanya dithulaganyô tsa tshirêlêtsô ya molelô ka mo borulêlông, inšorensense e fokoditswe tôta ke ditlamo tsa inšorensense.

Go ya ga "botala" mongwe o tshwanetse go ela tlhokô go tlhopa ditharabolo tsa tlhagô tsa mekgwa ya kagô le dimateriale. Ga gona kalafô ya go makatsa ya go tsosolosa polanete ya rona mme ka go tlhophya go dirisa borulêlô jwa bojang mongwe o mo tseleng e e siameng ya go tlisa phetogô.

MINIMAMO YOTLHE YA BOLENGDIPALO – R YA MARULÊLÔ

GO LEKANAYA AMOGANYÔ

Amoganyô ya themalê e kaya dimateriale kgotsa tlhakanô, tse di abelang thwantshô ya go elela ga bolelô. Bokgoni jwa go amoganya ga materiale bo lekgangwa pheteso ya themalê (k).

Pheteso ya themale e e kwa tlase e lekana le bokgoni jwa kamoganyô e e kwa godimo (Bolengpalô -R). Tiragalô ya themale ya dirwe le dithulaganyô, kwa ntle ga mafasetere le mejako, e tlhagisiwa ka theme ya bolengpalô-U

1. BOLENGPALO-K : PHETESO YA THEMALÊ

Bolengpalo-K, kgotsa pheteso ya themale e ranolwa jaaka boleng jwa mokgwa wa materiale jo bo bontshang bokgoni jwa go tsamaisa bothithô mo mmeleng ka maêmo a go tsepama.

Bolengpalo-K e thadisiwa ka di wate ka dimetara ka di Kelebine: $W/(m \cdot k)$.

2. BOLENGPALO-U: THOMELÔ YA THEMALÊ

Ka dinako tse dingwe amoganyô e reitiwa go ya ka thomelô ya themalê (Bolengpalô-U), bogolo go bolengpalo-R. Bolengpalo-U e lekanya pheteso ya bothithô ka matereale, elemente ya kagô kgotsa panele ya samentšhisi (thomelô ya themalê), jaaka bolengpalo-R e lekanya twantshô ya pheteso ya bothitho.

Bolengdipalo-U di dirisiwa gantsi mo dikwalông tsa thekeniki, bogolo tona go supa boleng jwa mekgwa ya themale ya galase le go balela tatlhego ya bothitho le mesola.

Bolengpalo-U ke thebana ya bolengpalo-R: $R=1/U$ kgotsa $U=1/R$. Sekao, ka bolengpalo-R ba 2.0, bolengpalo-U ke $\frac{1}{2}$ kgotsa 0.5.

Bolengdipalo-U di thadisiwa ka go dirisa diyuniti tsa meteriki ($W/m^2 \cdot K$) kwa:

- W, e kaya palo ya thomelo ya bothithô go rapalala sefatlhego kgotsa ka materiale ka diwate;
- m^2 , e kaya sekweremetara se le nngwe sa bokima jwa totobêtsô; le
- K kgotsa 'dekeri ya Kelevine' e kaya nngwe le nngwe ya go rapalala sefatlhego sa dimateriale kgotsa ka materiale ka pharologanyô ya themphereitšha °C.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

Bolengpalo jwa - A jo bonnye e feletsa e le kwa tlase ga kelêlô ya bothithô, ka jalo e kwa tlase ga tatlhêgô ya bothithô. Bolengdipalo-U tse kwa godimo ga tatlhêgo e kgolo ya bothithô.

3. BOLENGPALO-R: TWANTSHÔ YA THEMALÊ

Dimateriale tsa amoganyô di retilwe ka tiragatsô ya tsone ya kganetsô ya pheteso ya bothithô. Se se thadisiwa jaaka bolengpalo-R, gape e itsege jaaka twantshô ya themalê. Ka jalo, bolengpalo-R ke tekanyô ya twantshô ya kelêlô ya bothithô ka mo materialeng o o neetsweng o mokima. Jaaka, bolengpalo-R ke kaedi ya tiragatsô ya one jaaka amoganyô: Bogodimo jwa bolengpalo-R, ke bontsi jwa twantshô ya themalê ya materiale e e nang le yona (sk. Twantshô ya kelêlô ya bothithô) mme e tla abela amoganyô e e botoka.

Bolengdipalo-R di thadisiwa ka go dirisa diyuniti tsa meteriki $m^2.K/W$ (disekweremetara tsa Kelevine ka Wate) kwa:

- m^2 , e kaya sekweremetara sa materiale wa bokima jo bo rileng;
- K e kaya pharologanyô ya dekeri ya themphereits'hara e le nngwe (Kelevine kgotsa Celesiasê) go rapalala materiale; le
- W e kaya palo ya kelêlô ya bothithô ka go rapalala matereale ka diwate.

Go tswa mo dipholong tsa raporoto ya tekô ASTM C 518-10 by TTL letlha Seetebosigo 11, 2013, bolengpalo K ba borulêlô jwa bojang ke:
 $K = 0.056 W/(m.K)$

Bokima jo bo tlhokegang (D (m)) go sala morago SANS 10400- XA ke ka jalo:

TLHALOSÔ	Kgaolo ya tlelaemete 1	Kgaolo ya tlelaemete 2	Kgaolo ya tlelaemete 3	Kgaolo ya tlelaemete 4	Kgaolo ya tlelaemete 5	Kgaolo ya tlelaemete 6
Minimamo bolengpalo-R jo bo tlhokegang ($m^2.K/W$)	3.7	3.2	2.7	3.7	2.7	3.5
Minimamo wa bokima jwa marulêlô a bojang a tlhokegang (mm)	207	179	151	207	151	196
Tshupetsô ya kelêlô ya bothithô	godimo	godimo	Godimo & tlase	godimo	tlase	godimo

$$D(m) = R(m^2.K/W) \times k(W/(m.K))$$

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

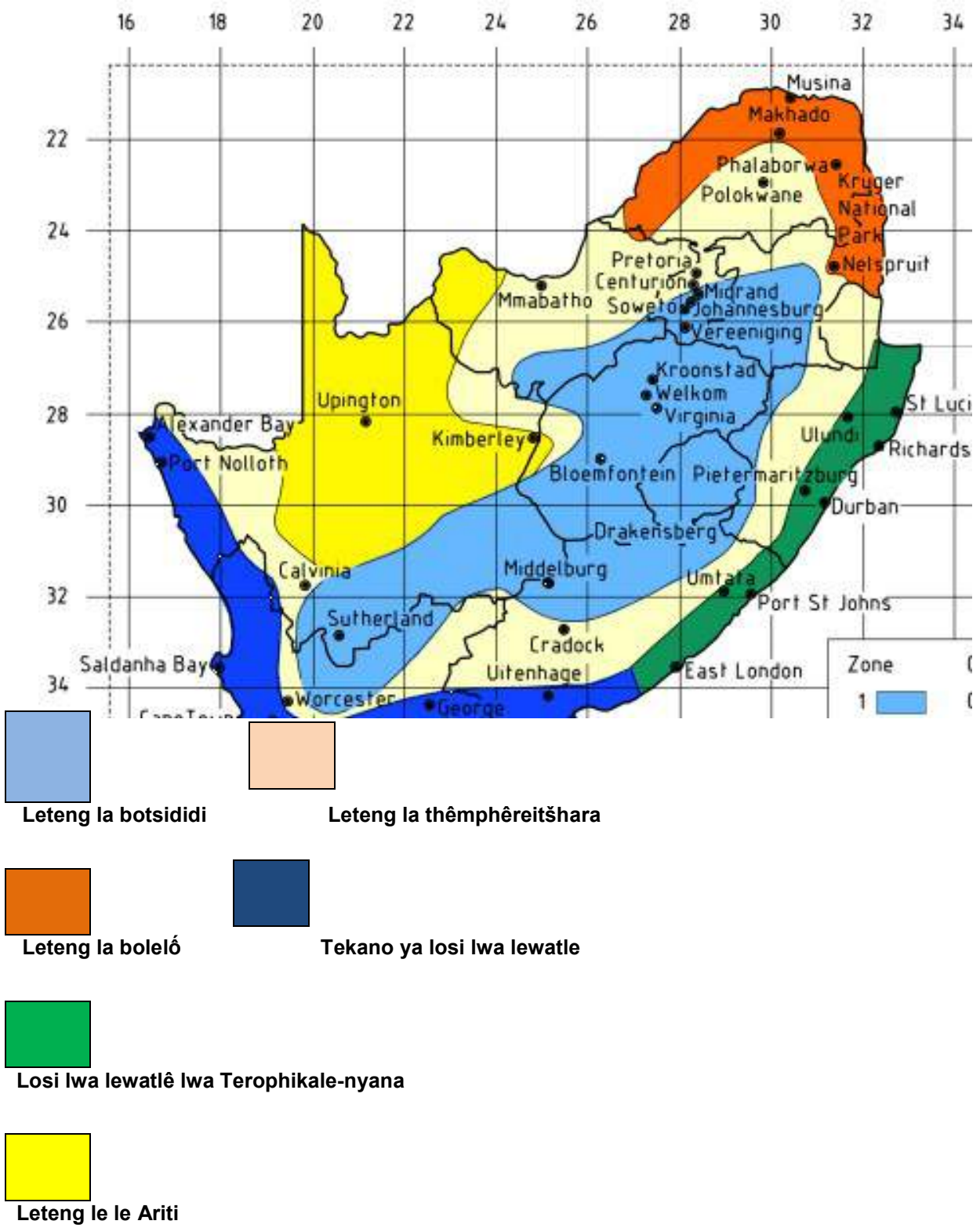
Legale, fa dipalelo tsa bokima kwa godimo di le kwa tlase ga ditlhokegô tsa SANS 10407-2015 Kgatiso ya 2 jaanong bogolo jwa nngwe ya tse pedi, e tla diriwa. Pharologanyô ya bokima e tla nna le tlhotlholetsô, ruri ya eneji mo boagông ka botlalo.

Ditlamelo tse di tshwanetse go kgotsofatsa di beilwe ka dikgaolo tsa tlelaemete, ka kakaretso ya nakaladi e e omileng ya themphereitšhara, tlhapologô ya themalê; bongôla le tekeletso ya phokafalo ya lebopô la borwa.

DIKGAOLO TSA TLELAEMETE KA MO AFORIKA BORWA

SELEKANYÔ SA DIKGAOLO TSA TLELAEMETE		
Kgaolo	Tlhaloso	Disentara tse kgolo tota
Kgaolo ya 1	Bogare jwa botsididi	Johannesburg, Bloemfontein
Kgaolo ya 2	Bogare jwa themphereitšhara	Pretoria, Polokwane
Kgaolo ya 3	Bogare jwa bothithô	Louis Trichardt, Nelspruit
Kgaolo ya 4	Themphereitšhara ya Lebopo	Cape Town, Port Elizabeth
Kgaolo ya 5	Lebopo la Teropikalenyana	East London, Durban, Richards Bay
Kgaolo ya 6	Bogare jo bo Ariti	Upington, Kimberley

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA



BOKHUTLÔ

Go tsengwa ga borulêlô jwa bojang ke kgaolo e e kgethegileng mme kaedi ya boithutelô le tirisanommogô di botlhokwa go netefatsa porojeke e e nang le katlego.

Mokgathô wa Borurêlô jwa Bojang mo Aforika Borwa (TASA) e teng go thusa setšhaba gape le baagiteke, baenjenêrê le barutegi ba bangwe ba ba nang le dipotsô.

DITEBOGO & DITSHUPETSO

SABS

Kagô ya borulêlô jwa bojang: SANS 10407 - 2015 Kgatiso ya 2
Kemo e e akaretsa sethalo sa go tshegetsa dipopêgô tsa borulêlô.

LEMOGA SANS 10400-L:2011 Kgatiso ya 3 e akaretsa sethalo sa dipopêgô tsa borulêlô, SANS 10400-T e akaretsa ditlhokegô tshirelêtsô ya molelô, le SANS 10400-V e akaretsa ditlhokegô tsa sentshamosi. SANS 2001-CT2 e akaretsa kago ya tiro ya kota ya sebopêgô ka mo borulêlông.

Makwalo o o latelang ke ditshupetsô tsa botlhokwa tota mo go bayang ga lekwalo le. Ka ditshupetsô tse di neetsweng letlha, ke kgatiso e dumeletsweng fela. Ka ditshupetsô tse di sa neelwang letlha ke kgatiso ya jaanong fela e e dumeletsweng (ka kakaretso ya ditshiamiso dingwe le dingwe). Tshedimosetsô ya dikemo e e dumeletsweng jaanong ya bosetšhaba le boditšhabatšhaba e ka amogêlwa go tswa mo SABS Karolo ya Dikemo.

SANS 457-2, Wooden poles, droppers, guardrail posts and spacer blocks – Part 2: Softwood species.

SANS 457-3, Wooden poles, droppers, guardrail posts and spacer blocks – Part 3: Hardwood species.

SANS 820, Mild steel nails.

SANS 1083, Aggregates from natural sources – Aggregates for concrete.

SANS 1288, Preservative-treated timber.

SANS 1707-2, Sawn eucalyptus timber – Part 2: Branding and battens.

SANS 1783-4, Sawn softwood timber – Part 4: Branding and battens.

SANS 2001-CT2, Construction works – Part CT2: Structural timberwork (roofing).

SANS 10005, The preservative treatment of timber.

SANS 10155, Accuracy in buildings.

SANS 10183-1, Adhesives for wood – Part 1: Terminology.

SANS 10183-2, Adhesives for wood – Part 2: Requirements for structural applications.

SANS 10400-B, The application of the National Building Regulations – Part B: Structural design.

SANS 10400-K, The application of the National Building Regulations – Part K: Walls.

SANS 10400-L, The application of the National Building Regulations – Part L: Roofs.

SANS 10400-T, The application of the National Building Regulations – Part T: Fire protection.

KAEDI YA BORULÊLÔ JWA BOJANG MO AFORIKA BORWA

SANS 10400-V, *The application of the National Building Regulations – Part V: Space heating.*

SANS 50197-1/EN 197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements.*

Mokwadi wa ditengkgolo le ditshwantshô:

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TASA MEMBERS

“GUIDE TO GOOD THATCHING PRACTICE”

Published by the division of Building and Construction Technology

CSIR, Po box 395, Pretoria, 0001

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Boutek report no bou/e9806

SAWPA

O ka tlhoma pala jang

TIPSASA

Tekanyo ya Tiragatsô ya Amoganyô

BOITATOLÔ

Marulêlô a bojang otlhe a tshwanetse go ya ka SANS 10407: 2015 kgatiso ya 2 totobetsô malebana le kagô ya borulêlô jwa bojang. E tshwanetse go agwa go ya ka dithalo tsa dipolane tsa meagô tse di thadilweng le tse di dumeletsweng ke moenjenêrê wa go rutega , wa bokgoni o a rejisetarilweng. Tumelanô ya se molao e tshwanetse go bonagala sentlê mo dithalong tsa ditshwantshô mme e tshwanetse go saena ke motho wa bokgoni.

Morago ga phêtso ya kago ya borulêlô jwa bojang, motho wa bokgoni le go rutega o tshwanetse go netefatsa gore kagô e ya ka totobetsô ya SANS 10407, gore e dirilwe go ya ka dithalô tsa ditshwantshô le gore boleng jwa tirsanômmogo e ne e le ya kemo ya borutegi

TASA ga e kitla e nna le boikarabelo jwa melato ya sebopegô, dithalo tsa go palelwa, tirsanômmogo ya go nyatsega kgotsa tshenyô ka tatelano phêtsô ya go lolama le ya go se lolame go tswa mo se se kwa godimo.