



TOTAL BUSINESS SOLUTION CO., LTD.

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MYANMAR CARLSBERG COMPANY LIMITED

ENVIRONMENTAL MANAGEMENT PLAN FOR BREWERY PRODUCTION

1ST REVISED

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ကတိကဝတ်များ

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၁	စီမံကိန်းနောက်ခံ အကြောင်းအရာ	အကောင်အထည်ဖော်ဆောင်ရွက်မည့် စီမံကိန်း ၏နောက်ခံအကြောင်းအရာများကို အသေးစိတ် ဖော်ပြထားပါသည်။	အခန်း(၁)
၁.၁	စီမံကိန်းအဆိုပြုသူ၏ အကြောင်းအရာနှင့်အုပ်ချုပ်မှုပုံစံ	စီမံကိန်းအဆိုပြု တာဝန်ယူဆောင်ရွက်မည့် ပုဂ္ဂိုလ်နှင့် ပတ်သက်သည့်အချက်အလက်များ (အမည်၊ ရာထူး နှင့် နေရပ်လိပ်စာ)တို့ကို အသေးစိတ်ဖော်ပြထားပြီး ရှယ်ယာပိုင်ဆိုင်သူ ပုဂ္ဂိုလ်တို့နှင့် အုပ်ချုပ်ပုံအဆင့်ဆင့်ကို ဇယား၊ ပုံတို့နှင့်တကွ အသေးစိတ်ဖော်ပြထားပါသည်။	
၁.၂	စီမံကိန်း ရည်ရွယ်ချက်	စီမံကိန်း၏ ရည်ရွယ်ချက်များကို အချက်(၄)ချက် ဖြင့် ဖော်ပြထားပါသည်။	
၁.၃	တာဝန်ယူဆောင်ရွက်မည့်ပုဂ္ဂိုလ် နှင့် အဖွဲ့အစည်း၏ နောက်ခံ အကြောင်းအရာ	စီမံကိန်းအဆိုပြု တာဝန်ယူဆောင်ရွက်မည့် ပုဂ္ဂိုလ်နှင့် ပတ်သက်သည့်အချက်အလက်များ (အမည်၊ ဆက်သွယ်ရန်လိပ်စာ၊ အီးမေးလိပ်စာ နှင့် ဖုန်းနံပါတ်)တို့နှင့် အဖွဲ့အစည်း၏ နောက်ခံအကြောင်းအရာတို့ကို အသေးစိတ်ဖော်ပြ ထားပါသည်။	
၂	ဥပဒေ/နည်းဥပဒေ	စီမံကိန်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်၊ စီမံကိန်းကတိကဝတ်အားလုံးနှင့် စည်းကမ်းချက်များကို အပြည့်အဝ အကောင်အ ထည်ဖော်ရမည့်အပြင် ယင်း၏ ကိုယ်စားစီမံကိန်း ကိုဆောင်ရွက်ပေးသူ ကန်ထရိုက်တာခွဲများ အားလုံးသည် စီမံကိန်းအတွက် လုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သက်ဆိုင်ရာဥပဒေ၊ ပတ်ဝန်း ကျင်ထိန်းသိမ်းရေးနည်းဥပဒေများ၊ ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ ကုမ္ပဏီ၏ မူဝါဒ များ၊ စီမံကိန်းနှင့်သက်ဆိုင်သော မူဝါဒ၊ ဥပဒေ၊ နည်းဥပဒေတို့ကို လိုက်နာဆောင်ရွက်ပါမည်။	အခန်း(၂)
၂.၁		အစီရင်ခံစာတွင် ဖော်ပြထားသော ကတိကဝတ် များအား အပြည့်အဝ လိုက်နာဆောင်ရွက်ရန်နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးနည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိ ခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၊ ကုမ္ပဏီ၏ မူဝါဒများ၊ စီမံကိန်းနှင့်သက်ဆိုင်သော မူဝါဒ၊ ဥပဒေ၊ နည်းဥပဒေတို့ကို လိုက်နာဆောင်ရွက် ပါမည်။	
၂.၂		လေအရည်အသွေးနှင့်ပတ်သက်၍ အမျိုးသားပတ် ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၏ အထွေထွေလမ်းညွှန်ချက်ပါ အပိုဒ် (၁.၁) သတ်မှတ်ချက်နှင့်အညီ လိုက်နာ ဆောင်ရွက်ပါမည်။	

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၂-၃		စွန့်ပစ်ရေအရည်အသွေးနှင့်ပတ်သက်၍ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်၏ အထွေထွေလမ်းညွှန်ချက်ပါ အပိုဒ် (၁.၂) သတ်မှတ်ချက်နှင့်အညီ လိုက်နာဆောင်ရွက်ပါမည်။	
၂-၄		ဆူညံသံအတွက် စီမံကိန်းဧရိယာပြင်ပရှိ အနီးဆုံး လက်ခံသည့်နေရာတွင် အခြေခံအဆင့်မှ အများဆုံးမြင့်တက်မှု 30 dBA ထက် မကျော်လွန်စေရေး လိုက်နာဆောင်ရွက်ပါမည်။	
၂-၅		သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဆိုင်ရာ ဥပဒေနှင့် ဆက်စပ်သည့် ဥပဒေ/နည်းဥပဒေ များကို ဖော်ပြထားပါသည်။	
၂-၆		ညစ်ညမ်းမှုထိန်းချုပ်ခြင်းနှင့် ကျန်းမာရေးဆိုင်ရာ ဥပဒေနှင့် ဆက်စပ်သည့် ဥပဒေ/နည်းဥပဒေ များကို ဖော်ပြထားပါသည်။	
၂-၇		မြို့ပြဖွံ့ဖြိုးတိုးတက်မှုနှင့် စီမံခန့်ခွဲမှုဆိုင်ရာ ဥပဒေ နှင့် ဆက်စပ်သည့် ဥပဒေ/နည်းဥပဒေများကို ဖော်ပြထားပါသည်။	
၂-၈		အလုပ်သမားဆိုင်ရာ ဥပဒေနှင့် ဆက်စပ်သည့် ဥပဒေ/နည်းဥပဒေများကို ဖော်ပြထားပါသည်။	
၂-၉		စီမံကိန်းနှင့် ဆက်စပ်သည့် အခြားဥပဒေ/ နည်းဥပဒေများကိုလည်း ဖော်ပြထားပါသည်။	
၂-၁၀		စွန့်ပစ်ပစ္စည်းများနှင့် ပတ်သက်၍ မြန်မာနိုင်ငံအမျိုးသားအဆင့် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုမဟာဗျူဟာနှင့် ပင်မလုပ်ငန်းအစီအစဉ် (၂၀၂၀) အတိုင်း လိုက်နာဆောင်ရွက်ပါမည်။	
၂-၁၁		အမျိုးသားပတ်ဝန်းကျင်ရေးရာမူဝါဒ၊ မြန်မာနိုင်ငံ ရာသီဥတုပြောင်းလဲမှုဆိုင်ရာ မူဝါဒ၊ မြန်မာနိုင်ငံ ရာသီဥတုပြောင်းလဲမှုဆိုင်ရာ မဟာဗျူဟာ၊ မြန်မာ နိုင်ငံ ရာသီဥတုပြောင်းလဲမှုဆိုင်ရာပင်မ လုပ်ငန်းစဉ် (၂၀၁၈-၂၀၃၀) အတိုင်း လိုက်နာ ဆောင်ရွက်ပါမည်။	
၃	စီမံကိန်းတည်နေရာ	အကောင်အထည်ဖော်ဆောင်ရွက်မည့် စီမံကိန်း တည်နေရာကို မြို့နယ်၊ ကိုဩဒိနိတ်အမှတ်၊ တည်နေရာမြေပုံ တို့ဖြင့် တိကျစွာဖော်ပြ ထားပါသည်။	အခန်း(၃)
၃-၁	ကုန်ကြမ်းပစ္စည်း	စီမံကိန်းတွင် ထုတ်လုပ်သည့် ထုတ်ကုန်များ အတွက် လိုအပ်သော ကုန်ကြမ်းပစ္စည်းများ၏ အမျိုးအစား နှင့် တစ်နှစ်အတွက် တင်သွင်းသော အရေအတွက်/ပမာဏ တို့ကို ဇယားဖြင့် အသေးစိတ် ဖော်ပြထားပါသည်။	
၃-၂	စက်ပစ္စည်းစာရင်း	စီမံကိန်းတွင် အသုံးပြုသည့် စက်ပစ္စည်း အမျိုးအစားများ၏ အမည်၊ အသုံးပြုသည့်နေရာ နှင့် ထုတ်လုပ်သည့်နိုင်ငံတို့ကို ဇယားဖြင့် အသေးစိတ် ဖော်ပြထားပါသည်။	

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၃.၃	ထုတ်ကုန်အမျိုးအစားများ	ထုတ်ကုန်အမျိုးအစားများ၏ အမည်၊ အရည်အသွေး၊ ထုတ်ပိုးသည့်ပုံစံနှင့် ထုတ်ပိုးသည့် အရွယ်အစားတို့ကို ဇယားဖြင့် အသေးစိတ် ဖော်ပြထားပါသည်။	
၃.၄	ထုတ်လုပ်ပုံအဆင့်ဆင့်	စီမံကိန်းလုပ်ငန်း၏ ထုတ်လုပ်ပုံအဆင့်ဆင့်ကို ပုံနှင့်တကွ ပြည့်စုံစွာ ရှင်းလင်းဖော်ပြထားပါသည်။	
၃.၅	အလုပ်သမားများအတွက် ဝန်ဆောင်မှု	အလုပ်သမားများအတွက် ဝန်ဆောင်မှု အနေဖြင့် စက်ရုံဆေးခန်း၊ စားသောက်ခန်း၊ အိမ်သာ နှင့် အခြား အထောက်အပံ့များ ပြုလုပ်ထားပေး ကြောင်း ဖော်ပြထားပါသည်။	
၃.၆	စွမ်းအင်အရင်းအမြစ်	စွမ်းအင်အရင်းအမြစ်များ အနေဖြင့် ရေ၊ လျှပ်စစ်၊ မီးစက်၊ ဆီသိုလောင်ကန်၊ ဘိုင်းလာ နှင့် စွန့်ပစ်ရေသန့်စင်မှုစနစ်၊ လေဝင်လေထွက်စနစ်၊ မီးဘေးကာကွယ်ရေးစနစ် နှင့် ရေစီးဆင်းမှု စနစ်များကို ပုံ၊ ဇယားများ နှင့်တကွ ပြည့်စုံစွာ ဖော်ပြထားပါ သည်။	
၃.၇	စွန့်ပစ်ပစ္စည်းပမာဏနှင့် အမျိုးအစား	စွန့်ပစ်ပစ္စည်းများကို အစိုင်အခဲစွန့်ပစ်ပစ္စည်းနှင့် စွန့်ပစ်အရည်ဟူ၍ နှစ်မျိုးခွဲခြားထားပြီး ဖော်ပြထားပါသည်။	
၄	ရုပ်ပိုင်းဆိုင်ရာအသွင်အပြင်	စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် နေရာနှင့် အကျယ် အဝန်းတို့ကို ဖော်ပြထားပါသည်။	အခန်း(၄)
၄.၁		စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် နေရာ၏ ရာသီဥတုနှင့် မိုးလေဝသဆိုင်ရာ အချက်အလက် များကို ပဲခူးမြို့နယ် အထွေထွေအုပ်ချုပ်ရေး ဦးစီးဌာန၊ ၂၀၁၉ မှ ကောက်နုတ် ဖော်ပြထား ပါသည်။	
၄.၂		စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် နေရာ၏ အနီးဝန်း ကျင်ရှိ မြေမျက်နှာသွင်ပြင် အနိမ့်အမြင့် အနေထားကို မြေပုံနှင့်တကွ ရှင်းလင်းဖော်ပြ ထားပါသည်။	
၄.၃		စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် နေရာ၏ အနီးဝန်း ကျင်ရှိ ဘူမိဗေဒဆိုင်ရာ အချက်အလက်များကို Khin Kyawt Kyawt Oo, 2013. Prediction of Ground Motion Parameters with Time History for Bago City,Bago Township, MSc (Thesis) မှကောက်နုတ်၍ မြေပုံနှင့်တကွ ဖော်ပြထားပါသည်။	
၄.၄		ငလျင်ဗေဒဆိုင်ရာ အချက်အလက်များကို မြေပုံနှင့်တကွ မိုးလေဝသနှင့်ဇေယျဗေဒ ညွှန်ကြားမှု ဦးစီးဌာန၊ ပဲခူး၊ မြန်မာမှ ကောက်နုတ် ဖော်ပြထား ပါသည်။	
၄.၅		မြေအောက်ရေဆိုင်ရာ အချက်အလက် များကို Khin Kyawt Kyawt Oo, 2013. Prediction of Ground Motion Parameters with Time History for Bago City,Bago Township, MSc (Thesis) မှကောက်နုတ် ဖော်ပြထားပါသည်။	

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၄.၆		သဘာဝပေါက်ပင်ဆိုင်ရာ အချက်အလက်များကို ဖော်ပြထားပါသည်။	
၄.၇		တောရိုင်းတိရစ္ဆာန်များဆိုင်ရာ အချက်အလက် များကို ဖော်ပြထားပါသည်။	
၄.၈	လူမှုစီးပွားဆိုင်ရာအချက်အလက်	စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် ပဲခူးမြို့နယ်ရှိ လူမှုစီးပွားဆိုင်ရာ အချက်အလက်များကို ပဲခူးမြို့နယ် အထွေထွေ အုပ်ချုပ်ရေးဦးစီးဌာန ဒေသ ဆိုင်ရာအချက်အလက် ၂၀၁၉ မှ ကောက်နှုတ် ဖော်ပြထားပါသည်။	
၄.၉	ယဉ်ကျေးမှုနှင့် ကိုးကွယ်မှုဆိုင်ရာ အချက်အလက်	ယဉ်ကျေးမှုနှင့် ကိုးကွယ်မှုဆိုင်ရာ အချက်အလက် များကို ပဲခူးမြို့နယ်၊ အထွေထွေအုပ်ချုပ်ရေး ဦးစီးဌာန ဒေသဆိုင်ရာအချက်အလက် ၂၀၁၉ မှ ကောက်နှုတ်ဖော်ပြ ထားပါသည်။	
၄.၁၀	ရေအရည်အသွေး(စွန့်ပစ်ရေ၊သန့်စင်ပြီးစွန့်ပစ်ရေ၊မြေအောက်ရေ၊ သန့်စင်ပြီးမြေအောက်ရေ)	စီမံကိန်းစက်ရုံတွင် ရေအရည်အသွေး(စွန့်ပစ်ရေ၊ သန့်စင်ပြီးစွန့်ပစ်ရေ၊ မြေအောက်ရေ၊ သန့်စင်ပြီး မြေအောက်ရေ)တို့အား နမူနာကောက်ယူပြီး ရရှိလာသော ရလဒ်တို့ကို အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (၂၀၁၅) နှင့် ကျန်းမာရေးဝန်ကြီးဌာန၊ အမျိုးသားသောက်သုံး ရေစံချိန်စံညွှန်း ၂၀၁၄ တို့နှင့် နှိုင်းယှဉ် ဖော်ပြထားပြီး ကောက်ယူသည့် နေရာအား မြေပုံနှင့်တကွ ဖော်ပြထားပါသည်။ စီမံကိန်းတွင် Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား တပ်ဆင်အသုံးပြု ဆောင်ရွက်လျက်ရှိသည့်အတွက် WWTP ၏ Real Time Results များကိုလည်း ထည့်သွင်းဖော်ပြထားပါသည်။	
၄.၁၁	လေအရည်အသွေး	စီမံကိန်းစက်ရုံတွင် လေအရည်အသွေးအား တိုင်းတာပြီး ရရှိလာသော ရလဒ်တို့ကို အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (၂၀၁၅) နှင့် နှိုင်းယှဉ် ဖော်ပြထားပြီး တိုင်းတာသည့်နေရာအား မြေပုံနှင့်တကွ ဖော်ပြထားပါသည်။	
၄.၁၂	တုန်ခါမှု	စီမံကိန်းစက်ရုံတွင် တုန်ခါမှုအား တိုင်းတာပြီး ရရှိလာသော ရလဒ်တို့ကို German Standard from DIN 4150 နှင့် နှိုင်းယှဉ် ဖော်ပြထားပြီး တိုင်းတာသည့်နေရာအား မြေပုံနှင့်တကွ ဖော်ပြထားပါသည်။	
၄.၁၃	အသံဆူညံမှု	စီမံကိန်းစက်ရုံတွင် အသံဆူညံမှုအား တိုင်းတာပြီး ရရှိလာသောရလဒ်တို့ကို အမျိုးသားပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (၂၀၁၅) နှင့် နှိုင်းယှဉ် ဖော်ပြထားပြီး တိုင်းတာသည့်နေရာအား မြေပုံနှင့် တကွ ဖော်ပြထားပါသည်။	
၄.၁၄	အလင်းရောင်	စီမံကိန်းစက်ရုံတွင် အလင်းရောင် အား တိုင်းတာပြီး International Finance Corporation (Environmental Health and Safety Guideline) General နှင့် နှိုင်းယှဉ် ဖော်ပြထားပါသည်။	

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၄.၁၅	အပူချိန်	စီမံကိန်းစက်ရုံတွင် အပူချိန်အား တိုင်းတာပြီး International Finance Corporation (Environmental Health and Safety Guideline) General နှင့် နှိုင်းယှဉ် ဖော်ပြထားပါသည်။	
၄.၁၆	မြေအသုံးချမှု	စီမံကိန်းလုပ်ငန်း တည်ရှိသည့် နေရာ၏ အနီးဝန်း ကျင်ရှိ မြေအသုံးချမှုဆိုင်ရာ အချက်အလက်များ ကို မြေပုံနှင့်တကွ ဖော်ပြထားပါသည်။	
၅	သဘာဝပတ်ဝန်းကျင်အပေါ် ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှု ဆန်းစစ်ခြင်း	သဘာဝပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေး ထိခိုက်မှုဆိုင်ရာ အကဲဖြတ်မှုကို ပတ်ဝန်းကျင် ရေးရာဌာန၊ တောင်အာဖရိကသမ္မတ နိုင်ငံ (စက်တင်ဘာ ၂၀၁၂)၊ ပတ်ဝန်းကျင်ထိခိုက်မှု အကဲဖြတ်ခြင်းစည်းမျဉ်းနှင့် ပြည်ထောင်စုပတ် ဝန်းကျင်ဆိုင်ရာ အကဲဖြတ်သုံးသပ်ရေးရုံး (နိုဝင်ဘာ ၁၉၉၄)၊ ကနေဒါနိုင်ငံ ပတ်ဝန်းကျင် အကဲဖြတ်ရေး ဥပဒေ အကိုးအကားလမ်းညွှန် စသည်တို့ကို ကိုးကားပြီး လေ့လာဆန်း စစ်ထားကြောင်း ဖော်ပြထား ပါသည်။	အခန်း(၅)
၅.၁		စီမံကိန်းတည်ဆောက်စဉ်၊ လည်ပတ်စဉ်နှင့် ဖျက်သိမ်းချိန် တို့တွင် ဖြစ်ပေါ်နိုင်သော ထိခိုက်မှုများကို လေ့လာဆန်းစစ်ဖော်ပြထား ပါသည်။	
၅.၂		လေထုအရည်အသွေးပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ်ဖော်ပြထားပါသည်။	
၅.၃		ဆူညံသံနှင့် တုန်ခါမှု အပေါ် ထိခိုက်နိုင်မှုအား လေ့လာဆန်းစစ်ဖော်ပြထား ပါသည်။	
၅.၄		ရေအရည်အသွေးအပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ် ဖော်ပြထားပါသည်။	
၅.၅		ကုန်းမြေအပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ် ဖော်ပြထားပါသည်။	
၅.၆		မြေဆီလွှာအပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ် ဖော်ပြထားပါသည်။	
၅.၇		စွန့်ပစ်အစိုင်အခဲအပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ်ဖော်ပြထားပါသည်။	
၅.၈		လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့်ဘေးကင်း လုံခြုံရေး အပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ် ဖော်ပြထားပါသည်။	
၅.၉		ယဉ်ကျေးမှု အမွေအနှစ်များအပေါ် ထိခိုက်နိုင်မှု အား လေ့လာဆန်းစစ်ဖော်ပြထားပါသည်။	
၅.၁၀		ဂေဟစနစ်အပေါ် ထိခိုက်နိုင်မှုအား လေ့လာ ဆန်းစစ် ဖော်ပြထားပါသည်။	


စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၅.၁၁		စီမံကိန်းတည်ဆောက်စဉ်၊ လည်ပတ်စဉ်နှင့် ဖျက်သိမ်းချိန် တို့တွင် ဖြစ်ပေါ်နိုင်သော ထိခိုက်မှုများကို ထိန်းချုပ်နိုင်ရန် သင့်လျော်သော လျော့ချရေးနည်းလမ်းများ (ဥပမာ။ ။စက်ရုံတွင်း စက်ဆီ၊ ချောဆီ၊ အမဲဆီများနှင့် ဘေးအန္တရာယ်ရှိသော ပစ္စည်းများယိုဖိတ်မှု ဖြစ်ပွားပါက စုပ်ယူနိုင်သော ပစ္စည်းများဖြစ်သည့် လွှစာမှုန့်၊ သဲ စသည်တို့အား အဆင်သင့်ထားရှိ ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်အဆင့်ဆင့်) ကိုဖော်ပြထားပါသည်။	
၆	လူထုတွေ့ဆုံဆွေးနွေးပွဲ	စီမံကိန်းလုပ်ငန်း၏ လူထုတွေ့ဆုံဆွေးနွေးပွဲဆိုင်ရာ အချက်အလက်များ၊ အများပြည်သူနှင့် သက်ဆိုင်ရာတာဝန်ရှိသူများ၏အကြံပြုဆွေးနွေးချက်များနှင့် ၎င်းဆွေးနွေးချက်များအပေါ်စီမံကိန်း အဆိုပြုသူမှ ဆက်လက်ဆောင်ရွက်သွားမည့် လုပ်ငန်းစဉ်များကို ပြည့်စုံစွာ ဖော်ပြထားပါသည်။	အခန်း(၆)
၇	ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်	ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် စီမံကိန်း တည်ဆောက်ချိန်၊ လည်ပတ်ချိန်နှင့် ဖျက်သိမ်းချိန် တို့တွင် သဘာဝဘေးအန္တရာယ်နှင့် ပတ်ဝန်းကျင် အရည်အသွေးများထိခိုက်မှုမရှိစေရန် ဆောင်ရွက် ထားရှိမှုအား အသေးစိတ်ဖော်ပြထားပါသည်။	အခန်း(၇)
၇.၁		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု၏ လျော့ချခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်းများတွင် တာဝန်ယူ ဆောင်ရွက်မည့်အဖွဲ့အစည်း ပုဂ္ဂိုလ်များ၊ တာဝန် ဝတ္တရားများ၊ အရေးပေါ်တုံ့ပြန်ရေး အစီအစဉ် များကို လည်း ပြည့်စုံစွာဖော်ပြထားပါသည်။	
၇.၂		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် လေအရည် အသွေးအတွက် လုပ်ငန်းခွင် အတွင်း လုံလောက်သော လေဝင်လေထွက်စနစ် /ပန်ကာများကို တပ်ဆင် ထားခြင်း၊ ဘွိုင်လာလည်ပတ်မှုစနစ်ကို ပုံမှန်ပြုပြင်ထိန်း သိမ်းခြင်း၊ ပစ္စည်းကိရိယာများကို အသုံးမပြုလျှင် ပိတ်ထားခြင်း၊ မီးစက်ခန်းအား လေဝင်လေထွက် ကောင်းအောင် ပြုလုပ်ထားခြင်း၊ လုပ်သားများအား လုံလောက်သော အကာအကွယ်ပစ္စည်းများ ထောက်ပံ့ပေးခြင်း၊ စက်ရုံအတွက် ဇီဝလောင်စာ အသုံးပြုခြင်း စသည်တို့ကို ဆောင်ရွက်သွား ပါမည်။	
၇.၃		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် စွန့်ပစ် အမှိုက်များကို ထွက်ရှိသော အရင်းအမြစ်အလိုက် အမျိုးအစားခွဲခြား၍ သီးခြားအမှိုက်ကန်များတွင် စနစ်တကျစွန့်ပစ်ခြင်း၊ အချို့သော စွန့်ပစ် ပစ္စည်းများကို ပြန်လည်အသုံးပြုခြင်း၊ အမှိုက်ပုံများတွင် အန္တရာယ်ရှိသောပစ္စည်းနှင့် အန္တရာယ် မရှိသောပစ္စည်း ဟူ၍ ခွဲခြားသတ်မှတ်ထားခြင်း စသည် တို့ကို ဆောင်ရွက်သွားပါမည်။	
၇.၄		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် စွန့်ပစ်ရေ သန့်စင်သည့်စက်ရုံ တည်ဆောက်ထားခြင်းနှင့် စွန့်ပစ်ပစ္စည်းများကို ပုံမှန်စောင့်ကြပ် ကြည့်ရှုခြင်း၊ မိလ္လာကန်များတည်ဆောက်ထားပြီး ၎င်းမိလ္လာ ကန်များကို ပုံမှန်စစ်ဆေးခြင်း၊ စသည်တို့ကို ဆောင်ရွက်သွားပါမည်။ Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား အသုံးပြု ဆောင်ရွက်လျက်ရှိသည့် စွန့်ပစ်ရေစီမံခန့်ခွဲမှုအစီအစဉ် အသေးစိတ်ကို ထည့်သွင်းဖော်ပြထားပါသည်။	

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
၇.၅		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ဆူညံသံနှင့် တုန်ခါမှု အတွက် ဆူညံသံထွက်ရှိမှု နည်းသော စက်ပစ္စည်းကိရိယာများကို အသုံးပြုခြင်း၊ စက်များကို ဆူညံသံထွက်ရှိမှု လျော့နည်းစေရန် ပုံမှန်ထိန်းသိမ်းခြင်းနှင့် ချောဆီထိုးခြင်းများ ပြုလုပ်ခြင်းဆူညံသံထွက်ရှိမှုကို ကာကွယ်ရန်နှင့် အသံ ပြန်ကန်မှုလျော့ချရန်အတွက် အသံစုပ် ယူနိုင်သော နံရံများအသုံးပြုခြင်းဖြင့် ဆူညံသံ ထွက်ရှိမှုကို ကာကွယ်ခြင်း၊ ဆူညံသံအလွန် အကျွံထွက်ရှိသော နေရာများတွင် ဝန်ထမ်းများကို လုံလောက်သော နားကြပ်များနှင့် နားအကာ အကွယ်ပစ္စည်းများ ထောက်ပံ့ပေးခြင်း၊ တုန်ခါမှုကိုလျော့ချရန် စနစ်တကျဒီဇိုင်း ထုတ်ထားသော စက်များကို ထုတ်လုပ်မှုလုပ်ငန်း စဉ်များတွင် အသုံးပြုခြင်း စသည်တို့ကို ဆောင်ရွက်သွားပါမည်။	
၇.၆		ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် စီမံကိန်း စက်ရုံတွင် မီးဘေးအန္တရာယ်ဆိုင်ရာကာကွယ်ခြင်း၊ မီးသတ် ကိရိယာများအသုံးပြုခြင်း၊ ရှေးဦးသူနာပြု နှင့် အရေးပေါ်ဆေးဘက်ဆိုင်ရာ ကယ်ဆယ်ရေး လေ့ကျင့်ပေးခြင်းနှင့် အရေးပေါ်အခြေအနေတို့ ပြန်ရေး အဖွဲ့ ဖွဲ့စည်းထားခြင်း၊ ဝန်ထမ်းများကို ဒေသဆိုင်ရာမီးသတ်အဖွဲ့အစည်းမှ အခြေခံမီး သတ်ခြင်းများ သင်တန်းပေးခြင်း၊ အရေးပေါ် တုံ့ပြန်မှုနှင့် လုပ်ငန်းစဉ်များကို စနစ်တကျ အစီအစဉ်ရေးဆွဲထားခြင်း၊ လုံလောက်သော PPEထောက်ပံ့ပေးခြင်း၊ မီးငြိမ်းသတ်ရေးကိရိယာ များ ထောက်ပံ့ပေးခြင်း၊ မိုးကြိုးလွှဲကိရိယာများ တပ်ဆင်ထားခြင်း၊ သတိပေးဆိုင်းဘုတ်များ၊ မီးသတ်ဌာန၊ လူနာတင်ယာဉ်ဝန်ဆောင်မှု၊ ဆေးရုံ၊ ရဲစခန်း တို့၏ ဖုန်းနံပါတ်များ အစရှိသဖြင့် ပြသပေးထားခြင်း၊ ဝန်ထမ်းများကို အလုပ်ခွင်၌ လုံခြုံရေးအသိရှိစေရန် သင်ကြားပေးခြင်း စသည် တို့ကို ဆောင်ရွက်သွားပါမည်။	
၇.၇		စီမံကိန်းဧရိယာသည် မိုးရာသီတွင် ရေကြီးခြင်းမှ ကာကွယ်ရန် လုံလောက်သော အမြင့်ရှိခြင်း၊ ရေကြီးခြင်းအခြေအနေကို ကာကွယ်ရန် ရေမြောင်းစနစ်အား မှန်ကန်စွာ စီမံခန့်ခွဲထားခြင်း၊ ရေကြီးခြင်းအခြေအနေတွင် ဘေးကင်းရာသို့ ရွှေ့ပြောင်းပေးခြင်းများကို အရေးပေါ်အခြေအနေ တုံ့ပြန်ရေးအဖွဲ့မှ လေ့ကျင့်ထားခြင်း စသည်တို့ကို လိုက်နာဆောင်ရွက်သွားမည်ဖြစ်ကြောင်း ကတိကဝတ်ပြုပါသည်။	
		လုပ်ငန်းခွင်နေရာများတွင် လုံခြုံမှုအခြေအနေ ပြုလုပ်ထားခြင်း၊ ကောင်းမွန်သော အလုပ်လုပ် ခြင်းအလေ့အကျင့်၊ ကောင်းမွန်သော လုံခြုံရေး အလေ့အကျင့် နှင့် ကောင်းမွန်သော ထိန်းသိမ်းမှု အလေ့အကျင့်များအတွက် ဝန်ထမ်းများကို လေ့ကျင့်သင်ကြားပေးခြင်း၊ လုပ်ငန်းခွင်နေရာ များတွင် မတော်တဆထိခိုက်မှု မဖြစ်အောင် ကာကွယ်ခြင်း၊ အန္တရာယ်ရှိသောပစ္စည်းများကို ကိုင်တွယ်အသုံးပြုစဉ်တွင် မျက်လုံးအကာအကွယ်နှင့် လက်အိပ်များကဲ့သို့ အကာအကွယ် ပစ္စည်းများ အသုံးပြုခြင်း၊ ဝန်ထမ်းများကို ကျန်းမာရေးအသိပေးသင်တန်းများနှင့် ရှေးဦး သူနာပြုစုနည်းသင်တန်းများ သင်ကြားပို့ချ လေ့ကျင့်ပေးခြင်း၊ ငှက်ဖျားရောဂါကာကွယ်ရေး၊ ကာလဝမ်းရောဂါကာကွယ်ရေး၊ အဆိပ်အတောက်မဖြစ်စေရေးနှင့် လိုအပ်သောဆေးဝါး များကို ရှေးဦးသူနာပြုသေတ္တာတွင်ထောက်ပံ့ ပေးထားခြင်း၊လုပ်ငန်းခွင်တွင် အစားအစာသန့် ရှင်းရေးနှင့် အသုံးအဆောင်ပစ္စည်းများသန့်ရှင်း မှုအတွက် လုံလောက်စွာ ထောက်ပံ့ပေးခြင်း၊ ထုတ်လုပ်မှုလုပ်ငန်းစဉ်နှင့် တိုက်ရိုက်သက်ဆိုင် သောဝန်ထမ်းများ ကူးစက်ရောဂါဖြစ်ပွားနေချိန်	

စဉ်	အကြောင်းအရာ	ကတိကဝတ်ရှင်းလင်းဖော်ပြချက်	ရည်ညွှန်းချက်
		တွင်အလုပ်မလုပ်စေခြင်း၊ အဆိုပြုစက်ရုံတွင် အသိအမှတ်ပြုလက်မှတ်ရသူနာပြုတစ်ဦးနှင့်ဆေးပေးခန်း ထားရှိပေးခြင်း၊လက်ရှိဝန်ထမ်းများ အတွက် နှစ်စဉ်ကျန်းမာရေး စစ်ဆေးမှု ပြုလုပ်ပေးခြင်း၊ ကျန်းမာရေးစစ်ဆေးမှု ပြုလုပ် ရန်အရည်အချင်းပြည့်မှီသောဆရာဝန် (သို့) သူနာ ပြုခန့်အပ်ထားခြင်း၊ အလုပ်ခွင်ထိခိုက်မှုများ အတွက် အစီရင်ခံခြင်းစသည်တို့ကို လိုက်နာ ဆောင်ရွက် သွားမည်ဖြစ်ကြောင်း ကတိကဝတ်ပြု ပါသည်။	
၈	နီဂုံး	အစီရင်ခံစာတွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီရင် ခံစာအတွက် မှန်ကန်တိကျသော အချက်အလက် များဖြင့် ရေးသားထားကြောင်း၊ လိုက်နာရမည့် ဥပဒေနှင့် နည်းဥပဒေ များ၊ သတ်မှတ်ထားသော စံချိန်စံညွှန်းများ၊ ဖြစ်ပေါ်နိုင်ချေရှိသော သက်ရောက်မှုများနှင့် ထိခိုက်မှုလျော့ချမည့် နည်းလမ်းများ၊ စောင့်ကြပ်ကြည့်ရှုမည့်နည်းများ နှင့် လူမှုစီးပွားအတွက် စီစဉ်ဆောင်ရွက် ထားရှိမှုများအား ပြည့်စုံစွာ ထည့်သွင်းရေးသား ထားကြောင်း ဖော်ပြထား ပါသည်။	အခန်း(၈)

ကတိကဝတ်များ

- (က) ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို တိကျခိုင်မာမှုများနှင့်ပြည့်စုံစွာ ဆောင်ရွက် ထားပါသည်။
- (ခ) ဤလုပ်ထုံးလုပ်နည်းများအပါအဝင် သက်ဆိုင်ရာဥပဒေများကို တိကျစွာလိုက်နာ၍ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်များကို ရေးဆွဲထားပါသည်။
- (ဂ) စီမံကိန်းသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပါ ကတိကဝတ်၊ ပတ်ဝန်းကျင် ထိခိုက်မှု လျှော့ချရေး လုပ်ငန်းများနှင့် အစီအစဉ်များကို အပြည့်အဝ အစဉ်အမြဲလိုက်နာ ဆောင်ရွက် သွားမည် ဖြစ်ကြောင်း ကတိကဝတ်ပြုပါသည်။
- (ဃ) လုပ်ငန်းလည်ပတ်ဆောင်ရွက်နေသည့် ကာလအတွင်း အတည်ပြုထားသည့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်အား တိုးတက်နေသည့် နည်းပညာများ၊ ဓနစ်များနှင့် လုပ်ငန်း လိုအပ်ချက် အပေါ်မူတည်၍ ပိုမိုကောင်းမွန်သည့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် ဖြစ်စေရန်အတွက် ပြင်ဆင်ဖြည့်စွက်ရန် ညွှန်ကြားချက်ရှိလာပါက ဆောင်ရွက်မည် ဖြစ်ကြောင်းနှင့် လုပ်ငန်း ဆောင်ရွက်သူမှ ပြင်ဆင်ဖြည့်စွက်လိုပါက တင်ပြအတည်ပြုချက် ရယူ၍ ပြင်ဆင်ဆောင်ရွက် ပေးမည် ဖြစ်ပါသည်။
- (င) စီမံကိန်းပိတ်သိမ်းချိန်တွင် လူမှုပတ်ဝန်းကျင်အား ထိခိုက်မှုအနည်းဆုံး ဖြစ်စေရန် စီမံဆောင်ရွက် ပေးမည်ဖြစ်ပြီး ထိခိုက်မှုများ ရှိလာပါက မူလအခြေအနေသို့ ရောက်ရှိ စေရန် ဆောင်ရွက်ပေးမည် ဖြစ်ပါသည်။


Thaw Zaw
၁၁/၇/၂၀၂၂
၁၀၀၇၇၇
Myanmar Carlsberg Co., Ltd.



အကြံပေးအဖွဲ့အစည်း၏ဝန်ခံချက်

ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် အစီရင်ခံစာသည် အကြံပေးအဖွဲ့အစည်း၏ လုပ်ငန်းဆိုင်ရာ နားလည်တတ်ကျွမ်းမှုနှင့် စုံစမ်းရရှိသော အချက်အလက်များကို အခြေခံ၍ ပြည့်စုံ မှန်ကန်မှုရှိအောင် ဆောင်ရွက်ထားပါကြောင်း ဝန်ခံပါသည်။



Dr. Soe Moe Kyaw Win
MANAGING DIRECTOR
TOTAL BUSINESS SOLUTION CO., LTD.

Managing Director
Total Business Solution Co., Ltd.



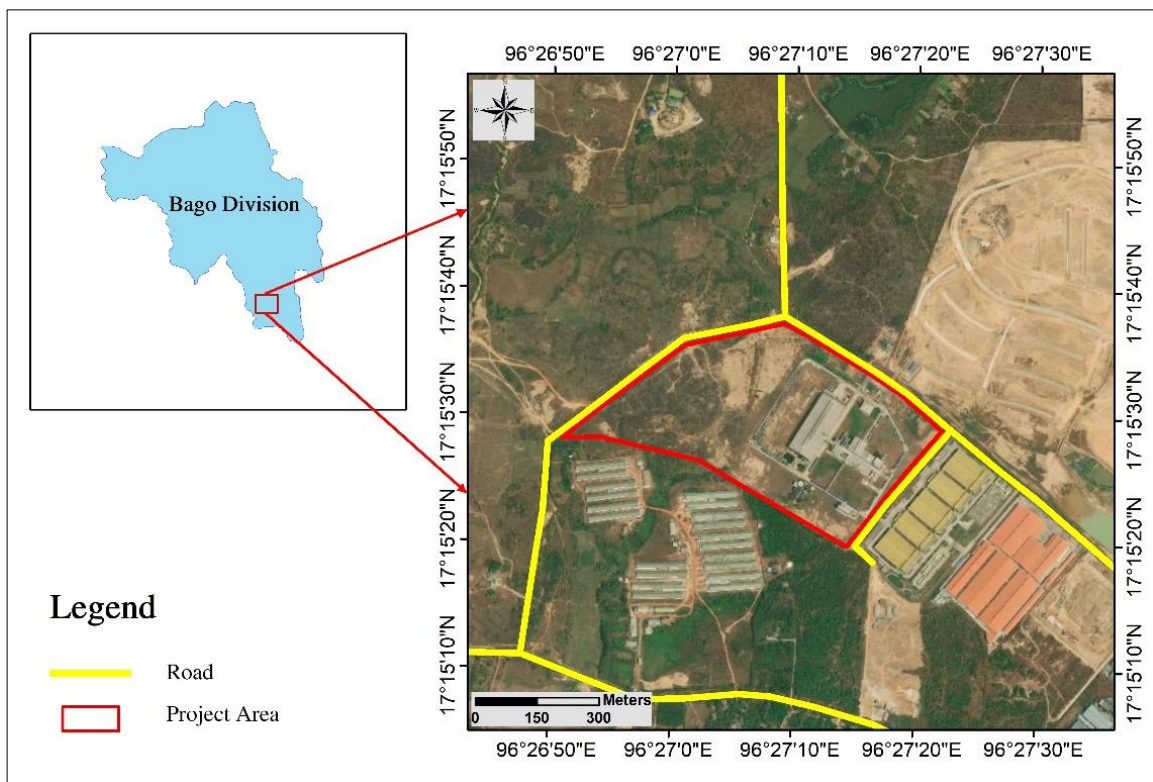
ABBREVIATION

BCDC	Bago City Development Committee
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographic Information System
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IGES	Institute of Global Environmental Strategies
MGS	Myanmar Golden Star Beverages Co., Ltd.
MIC	Myanmar Investment Commission
MOECF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
NDWQS	National Drinking Water Quality Standards
NEQEG	National Environmental Quality Emission Guidelines
OHSE	Occupational Health, Safety and Environmental Program
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
TBS	Total Business Solution Co., Ltd.
US EPA	United States Environmental Protection Agency
WHO	World Health Organization
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

အစီရင်ခံစာအကျဉ်းချုပ်

၁။ စီမံကိန်း၏ နောက်ခံအကြောင်းအရာ

Carlsberg Co. , Ltd. ၏ လက်အောက်ခံကုမ္ပဏီတစ်ခုဖြစ်သည့် Myanmar Carlsberg (Myanmar Carlsberg) သည် ၂၀၁၃ ခုနှစ်တွင်ပြည်တွင်းမိတ်ဖက် Myanmar Golden Star (MGS) Beverages Co. , Ltd. နှင့်စတင်တည်ထောင်ခဲ့ပြီး ၂၀၁၄ ခုနှစ်တွင်ဖွင့်လှစ်ခဲ့သည်။ Myanmar Carlsberg ၏ရယ်ယာပါဝင်မှုသည် ၅၁ % ဖြစ်ပြီး ၄၉% မှာ MGS ကုမ္ပဏီ မှဖြစ်ပါသည်။ ၎င်းသည်နိုင်ငံခြား ရင်းနှီးမြှုပ်နှံမှုဥပဒေနှင့် မြန်မာကုမ္ပဏီများအက်ဥပဒေအရ တည်ထောင်ထားသော နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုကုမ္ပဏီဖြစ်သည်။ စီမံကိန်း၏ ခွင့်ပြုထားသောသက်တမ်းသည် မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ခွင့်ပြုမိန့်ထုတ်ပေးသည့်နေ့မှစ၍ နှစ်ပေါင်း ၅၀ ဖြစ်သည်။ ရင်းနှီးမြှုပ်နှံမှု အမျိုးအစားမှာ ဖက်စပ်ဖြစ်ပြီး ကုမ္ပဏီသည် Carlsberg၊ Black Eagle၊ Tuborg နှင့် YOMA ဘီယာ စသည့် အမှတ်တံဆိပ် ၄ ခုနှင့်ကုန်ပစ္စည်းများကိုထုတ်လုပ်ဖြန့်ဖြူးသည်။ (စီမံကိန်းတည်နေရာပြ မြေပုံကို ပုံ ၁ တွင် ဖော်ပြထားပါသည်။)



ပုံ ၁ စီမံကိန်းတည်နေရာပြ မြေပုံ

Myanmar Carlsberg ကုမ္ပဏီ စက်ရုံ၏ စက်ကိရိယာများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံကို နိုင်ငံတကာ စံနှုန်းနှင့်ကိုက်ညီရန် စီစဉ်ထားသည်။ စီမံကိန်းသည်ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့နယ်၊ စက်မှုဇုန် (နိုင်ငံခြား)၊ လုပ်ကွက် ၃ မှ ၁၃ အထိဖြစ်ပါသည်။ စီမံကိန်း၏တည်နေရာမှာ မြောက်လတ္တီတွဒ် ၁၇ ° ၁၅

'၂၈.၆၅' နှင့် အရှေ့လောင်ဂျီတွဒ် ၉၆ ° ၂၇' ၁၃.၅၁ " အကြားတွင်တည်ရှိသည်။ စက်ရုံ၏စုစုပေါင်း ဧရိယာမှာ ၅၃.၇၅ ဧကဖြစ်သည်။ လက်ရှိအချိန်တွင်ဤစက်ရုံတွင်အလုပ်သမား ၇၅ ဦး ဖြင့်လည်ပတ် နေပါသည်။ (အသေးစိတ်ကို အခန်း ၁ တွင် ကြည့်ရှုပါရန်)

၂။ ဥပဒေမူဝါဒများ

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ရေးဆွဲရာတွင် ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေး နည်းဥပဒေ ၅၀/၂၀၁၄ နှင့် ပတ်ဝန်းကျင်ထိခိုက်သက်ရောက်မှု လေ့လာဆန်းစစ်ခြင်းလုပ်ငန်းစဉ် အမှတ် ၆၁၆/၂၀၁၅ တို့နှင့်အညီ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ကို ပြုစုရေးသားမည်ဖြစ်သည်။ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်သည် သဘာဝပတ်ဝန်းကျင်ကို ကာကွယ်ထိန်းသိမ်းရန် ရည်ရွယ် ရေးသားထားပြီး စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်ဆိုးကျိုးသက်ရောက်မှုများအား လျှော့ချရန်နှင့် ကာကွယ်ရန်တို့ကို ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေး နည်းဥပဒေ ၅၀/၂၀၁၄၊ အခန်း ၁၁ အပိုဒ်ခွဲ (၅၂) အရ လုပ်ဆောင်ရန်ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ပါဝင်ရမည့် နည်းဥပဒေ အသေးစိတ်ကို အခန်း (၂) တွင်ဖော်ပြထားပါသည်။ စီမံကိန်းနှင့်ပတ်သက်သော ဥပဒေများကို အောက်ပါ အတိုင်းဖော်ပြ ထားပါသည်။

- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၃၀ ရက်၊ မတ်လ၊ ၂၀၁၂ ခုနှစ်)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေများ (၅ ရက်၊ ဇွန်လ၊ ၂၀၁၄ ခုနှစ်)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ (၂၉ ရက်၊ ဒီဇင်ဘာလ၊ ၂၀၁၅ ခုနှစ်)
- အမျိုးသားသဘာဝပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒ (၂၀၁၉ ခုနှစ်)
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၉ ရက်၊ ဒီဇင်ဘာလ၊ ၂၀၁၅ ခုနှစ်)
- အမျိုးသားသောက်သုံးရေအရည်အသွေးစံနှုန်းများမူကြမ်း (၂၀၁၄ ခုနှစ်)
- ပြည်သူ့ကျန်းမာရေးဥပဒေ (၁၉၇၂ ခုနှစ်)
- ဆေးလိပ်နှင့်ဆေးရွက်ကြီးထွက်ပစ္စည်းသောက်သုံးမှု ထိန်းသိမ်းရေး ဥပဒေ (၄ ရက်၊ မေလ၊ ၂၀၀၆ ခုနှစ်)
- ကူးစက်ရောဂါ ကာကွယ်နှိမ်နင်းရေးဥပဒေ (၂၀ ရက်၊ မတ်လ၊ ၁၉၉၅ ခုနှစ်)
- အလုပ်အကိုင်လုံခြုံမှုနှင့်ကျန်းမာရေးဥပဒေ (၁၅ ရက်၊ မတ်လ၊ ၂၀၁၉ ခုနှစ်)
- ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများအန္တရာယ်မှတားဆီးကာကွယ်ရေးဥပဒေ (၂၆ ရက်၊ ဩဂုတ်လ၊ ၂၀၁၃ ခုနှစ်)
- မြန်မာနိုင်ငံမီးသတ်တပ်ဖွဲ့ဥပဒေ (၁၇ ရက်၊ မတ်လ၊ ၂၀၁၅ ခုနှစ်)

- ဇီဝမျိုးစုံမျိုးကွဲများနှင့်သဘာဝထိန်းသိမ်းရေးနယ်မြေဥပဒေ (၂၀၁၈ ခုနှစ်)
- တောရိုင်းတိရစ္ဆာန်ကာကွယ်စောင့်ရှောက်ရေးနှင့်သဘာဝဧရိယာထိန်းသိမ်းရေးဥပဒေ (၈ ရက်၊ ဇွန်လ၊ ၁၉၉၄ ခုနှစ်)
- သစ်တောဥပဒေ (၃ ရက်၊ နိုဝင်ဘာလ၊ ၁၉၉၂ ခုနှစ်)
- ငါးမွေးမြူရေးနှင့်ပတ်သက်သောဥပဒေ (၇ ရက်၊ စက်တင်ဘာလ၊ ၁၉၈၉ ခုနှစ်)
- အမျိုးမျိုးကွဲပြားခြားနားသော ဇီဝဗေဒဆိုင်ရာဘဝနှင့် သဘာဝပတ်ဝန်းကျင် ကာကွယ်စောင့်ရှောက်ရေးဥပဒေ (၂၁ ရက်၊ မေလ၊ ၂၀၁၈ ခုနှစ်)
- ရေအရင်းအမြစ်နှင့် မြစ်ချောင်းများထိန်းသိမ်းရေးဥပဒေ (၂ ရက်၊ အောက်တိုဘာလ၊ ၂၀၀၆ ခုနှစ်)
- ရေအရင်းအမြစ်နှင့် မြစ်ချောင်းများထိန်းသိမ်းရေး စည်းမျဉ်းများ (၂၇ ရက်၊ ဇန်နဝါရီလ၊ ၂၀၁၃ ခုနှစ်)
- မြေအောက်ရေအက်ဥပဒေ (၂၁ ရက်၊ ဇွန်လ၊ ၁၉၃၀ ခုနှစ်)
- မြေသိမ်းဆည်းခြင်း၊ ပြန်လည်နေရာချထားခြင်းနှင့် ပြန်လည်ထူထောင်ခြင်းဆိုင်ရာဥပဒေ (၂၄ ရက်၊ ဩဂုတ်လ၊ ၂၀၁၉ ခုနှစ်)
- ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈ ခုနှစ်)
- မြေဝယ်ယူရေးအက်ဥပဒေ (၁၈၉၄ ခုနှစ်)
- မြေယာပိုင်ဆိုင်မှုဆိုင်ရာဥပဒေ (၁၉၅၃ ခုနှစ်)
- လယ်ယာမြေဥပဒေ (၃၀ ရက်၊ မတ်လ၊ ၂၀၁၉ ခုနှစ်)
- လယ်ယာမြေ စည်းမျဉ်းများ (၂၀၁၂ ခုနှစ်)
- မြေလွတ်၊ မြေလပ်နှင့်မြေရိုင်းများစီမံခန့်ခွဲမှုဥပဒေ (၂၀၁၈ ခုနှစ်)
- စာချုပ်စာတမ်းများမှတ်ပုံတင်ဥပဒေ (၂၀ ရက်၊ မတ်လ၊ ၂၀၁၉ ခုနှစ်)
- နယ်နိမိတ်ဥပဒေ (၂၅ ရက်၊ မတ်လ၊ ၂၀၁၉ ခုနှစ်)
- ဖွံ့ဖြိုးရေးကော်မတီဥပဒေ (၂၀၁၃ ခုနှစ်)
- ပဲခူးတိုင်းဒေသကြီးဖွံ့ဖြိုးတိုးတက်ရေးဥပဒေ (၂၇ ရက်၊ ဒီဇင်ဘာလ၊ ၂၀၁၆ ခုနှစ်)
- မြန်မာနိုင်ငံအင်ဂျင်နီယာကောင်စီဥပဒေ (၂၈ ရက်၊ နိုဝင်ဘာလ၊ ၂၀၁၃ ခုနှစ်)
- လျှပ်စစ်ဥပဒေ (၂၇ ရက်၊ အောက်တိုဘာလ၊ ၂၀၁၄ ခုနှစ်)
- အလုပ်သမားအဖွဲ့အစည်းဥပဒေ (၁၁ ရက်၊ အောက်တိုဘာလ၊ ၂၀၁၁ ခုနှစ်)
- အလုပ်အကိုင်နှင့်ကျွမ်းကျင်မှု ဖွံ့ဖြိုးတိုးတက်ရေး ဥပဒေ (၃ ရက်၊ ဩဂုတ်လ၊ ၂၀၁၃ ခုနှစ်)

- အနိမ့်ဆုံးအခကြေးငွေဥပဒေ၊ နည်းဥပဒေ (၂၂ ရက်၊မတ်လ၊ ၂၀၁၃ ခုနှစ်)
- လုပ်ခလစာပေးချေခြင်းဥပဒေ (၂၅ ရက်၊ ဇန်နဝါရီလ၊ ၂၀၁၆ ခုနှစ်)
- အလုပ်သမားရေးရာအငြင်းပွားမှုဖြေရှင်းရေးဥပဒေ (၂၈ ရက်၊မတ်လ၊ ၂၀၁၂ ခုနှစ်)
- ခွင့်နှင့်အားလပ်ရက်အက်ဥပဒေ (ဇူလိုင်လ၊ ၂၀၁၄ ခုနှစ်)
- လူမှုဖူလုံရေးဥပဒေ (၃၁ ရက်၊ ဩဂုတ်လ၊ ၂၀၁၂ ခုနှစ်)
- မသန်စွမ်းသူများ၏အခွင့်အရေးဥပဒေ (၉ ရက်၊ ဇွန်လ၊ ၂၀၁၅ ခုနှစ်)
- ကလေးအခွင့်အရေးဥပဒေ (၂၃ ရက်၊ ဇူလိုင်လ၊ ၂၀၁၉ ခုနှစ်)
- ယဉ်ကျေးမှုအမွေအနှစ်ဒေသကာကွယ်စောင့်ရှောက်ရေးနှင့်ထိန်းသိမ်းရေးဥပဒေ (၂၈ ရက်၊ ဖေဖော်ဝါရီလ၊ ၂၀၁၉ ခုနှစ်)
- ရှေးဟောင်းအဆောက်အအုံများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ (၂၆ ရက်၊ ဩဂုတ်လ၊ ၂၀၁၅ ခုနှစ်)
- ရှေးဟောင်းဝတ္ထုပစ္စည်းများကာကွယ်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၅ ခုနှစ်)
- စက်ရုံများအက်ဥပဒေ (၂၀ ရက်၊ ဇန်နဝါရီလ၊ ၂၀၁၆ ခုနှစ်)
- ယစ်မျိုးဥပဒေ (၂၂ ရက်၊အောက်တိုဘာလ၊ ၂၀၁၅ ခုနှစ်)
- ဘွိုင်လာဥပဒေ (၁၄ ရက်၊ဇူလိုင်လ၊ ၂၀၁၅ ခုနှစ်)
- စားသုံးသူကာကွယ်ရေးဥပဒေ (၁၄ ရက်၊ မတ်လ၊၂၀၁၄ ခုနှစ်)
- သဘာဝဘေးအန္တရာယ်ဆိုင်ရာ စီမံခန့်ခွဲမှု ဥပဒေ (၃၁ ရက်၊ ဇူလိုင်လ၊၂၀၁၃ ခုနှစ်)
- စံချိန်စံညွှန်းသတ်မှတ်ခြင်းဆိုင်ရာဥပဒေ (၃ ရက်၊ ဇူလိုင်လ၊၂၀၁၄ ခုနှစ်)
- ပို့ကုန်နှင့်တင်သွင်းမှုဥပဒေ (၁၇ ရက်၊စက်တင်ဘာလ၊ ၂၀၁၂ ခုနှစ်)
- မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုဥပဒေများ (၁၈ ရက်၊ အောက်တိုဘာလ၊၂၀၁၆ ခုနှစ်)
- မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုစည်းမျဉ်းများ (၃၀ ရက်၊ မတ်လ၊၂၀၁၇ ခုနှစ်)
- မြန်မာနိုင်ငံအာမခံလုပ်ငန်းဥပဒေ (၂၃ ရက်၊ ဇူလိုင်လ၊၁၉၉၃ ခုနှစ်)
- ပုဂ္ဂလိကစက်မှုလုပ်ငန်းဥပဒေ (၂၆ ရက်၊ နိုဝင်ဘာလ၊ ၁၉၉၀ ခုနှစ်)
- ရေနံနှင့်ရေနံထွက်ပစ္စည်းဥပဒေ (၁ ရက်၊ ဩဂုတ်လ၊၂၀၁၇ ခုနှစ်)
- မော်တော်ယာဉ်ဥပဒေ(၇ ရက်၊စက်တင်ဘာလ၊၂၂ ၂၀၁၅ ခုနှစ်)
- ကုန်အမှတ်တံဆိပ်ဥပဒေ (၂၀၁၉ခုနှစ်)
- မြန်မာကုမ္ပဏီဥပဒေ (၇ ရက်၊ စက်တင်ဘာလ၊၂၀၁၅ ခုနှစ်)
- ကုန်သွယ်လုပ်ငန်းခွန်ဥပဒေ (၂၄ ရက်၊မတ်လ၊ ၂၀၁၄ ခုနှစ်)
- ကုန်ပစ္စည်းခွန်ဥပဒေ (၁၈ ရက်၊ ဇန်နဝါရီလ၊ ၂၀၁၆ ခုနှစ်)

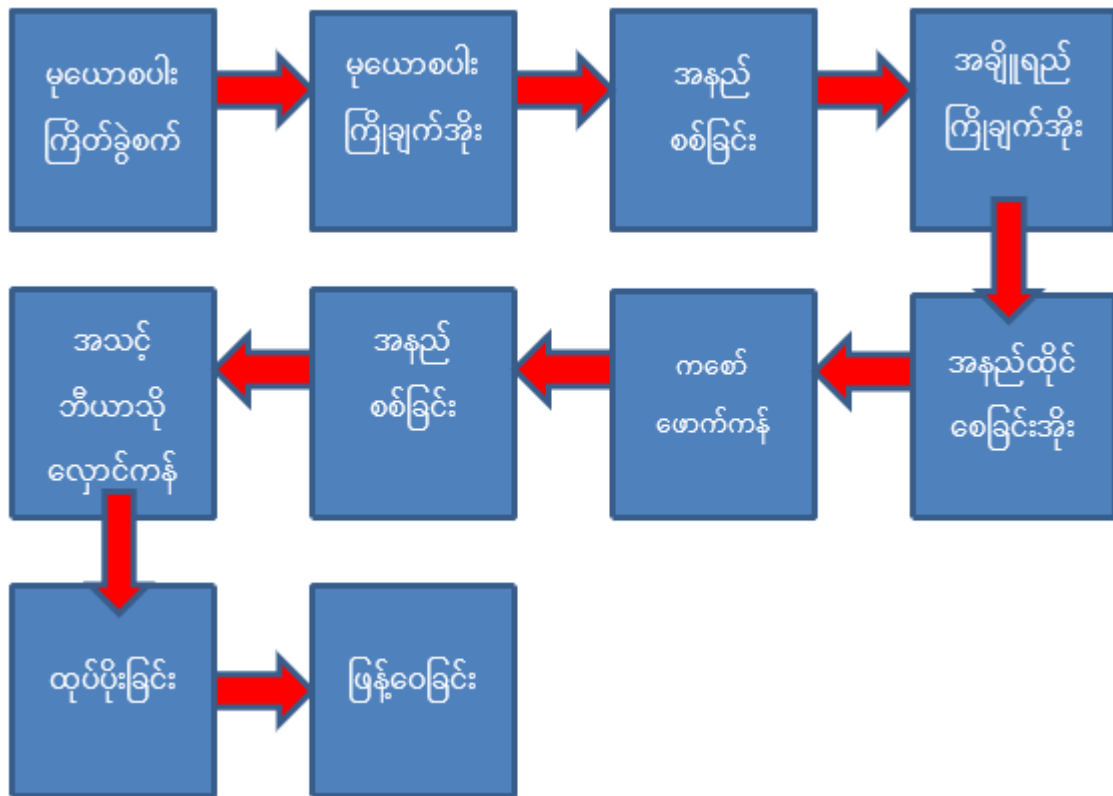
၃။ ထုတ်လုပ်ပုံလုပ်ငန်း အဆင့်ဆင့်

ဤစီမံကိန်းသည်အဆင့်မြင့်နည်းပညာများ အသုံးပြု၍ ဘီယာထုတ်လုပ်သည့်စက်ရုံဖြစ်သည်။ စီမံကိန်းစက်ရုံမှ ထုတ်လုပ်သည့် ထုတ်ကုန်များ ကို ဇယား ၁ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁ စီမံကိန်းစက်ရုံမှ ထုတ်လုပ်သည့် ထုတ်ကုန်များ



မုယော၊ ဆန်၊ တဆေး၊ သကြားနှင့် အခြားအထောက်အကူပြုပစ္စည်းများသည် ဘီယာထုတ်လုပ်ရာတွင်သုံးသော အဓိကကုန်ကြမ်းအမျိုးအစားများဖြစ်ကြသည်။ ပထမအနေဖြင့် ဆန်နှင့် မုယောစပါးကို ကြိတ်ခွဲစက်ဖြင့်ကြိတ်ခွဲသည်။ ကြိတ်ခွဲထားသော ဆန်နှင့်မုယောစပါးအမှုန့်များကို ကြိုချက်အိုးထဲတွင် ရေနွေးနှင့် ရောနှောကြိုချက်သည်။ ၎င်းကြိုချက်ပြီးအရည်ကို ပဏာမ အနည်စစ်စက်သို့ဖြတ်စေပြီး အချိုရည်ကြိုချက်အိုးထဲတွင် လိုအပ်သောအရသာထွက်စေရန် အခြား အထောက်အကူပြုပစ္စည်းများထည့်၍ နောက်တစ်ကြိမ်ထပ်မံကြိုချက်စေသည်။ ၎င်းကြိုချက်ပြီး အချိုရည်များကို အနည်ထိုင်ကန်သို့ ပြောင်းရွှေ့အနည်ထိုင်စေသည်။ ၎င်းနောက် Glycol အသုံးပြု၍ ကြိုချက်ပြီး အချိုရည်များကို အအေးခံစေသည်။ ထို့နောက် အချဉ်ဖောက်ခြင်းစတင်ရန် အမိုးနီးယား အသုံးပြု၍ အအေးခံထားသော အချိုရည်များကို တဆေးထည့်၍ အချဉ်ဖောက်ကန်အတွင်း ဘီယာအရသာ အပြည့်အဝ ရရှိချိန်ထိတိုင်အောင် အချဉ်ဖောက်သည်။ ၎င်းဘီယာကို အသင့်ဘီယာသိုလှောင်ကန်ထဲသို့မဖြည့်မှီ နောက်ဆုံးအဆင့် အနေဖြင့် ဒုတိယအကြိမ်အနည်စစ်သည်။ သောက်သုံးရန် အသင့်ဖြစ်နေသော သိုလှောင်ကန်ရှိ ဘီယာ များကို ပိုးသတ်ထားသောဘီယာစည်၊ သံဗူးနှင့် ပုလင်းများထဲသို့ထည့်၍ ထုပ်ပိုးပြီးနောက် ဈေးကွက်သို့ တင်ပို့ရောင်းချသည်။ ဘီယာထုတ်လုပ်မှု လုပ်ငန်းစဉ်၏ ဇယားကွက်ကို ပုံ ၂ တွင် ပြထားသည်။ (အသေးစိတ်ကို အခန်း ၃ တွင် ကြည့်ရှုပါရန်)



ပုံ ၂ ထုတ်လုပ်ခြင်းလုပ်ငန်းအဆင့်ဆင့်

၄။ ပတ်ဝန်းကျင်အခြေအနေ လေ့လာမှု

ပတ်ဝန်းကျင်အခြေအနေ လေ့လာခြင်း၏ ရည်ရွယ်ချက်မှာ စီမံကိန်းအနီးအနားရှိ ပတ်ဝန်းကျင် တည်ရှိမှုအခြေအနေ နှင့် လူမှုစီးပွားအပေါ်အကျိုးသက်ရောက်မှုများကို လေ့လာ တင်ပြရန် ဖြစ်ပါသည်။ ထိုသို့လေ့လာရာတွင် စီမံကိန်းဧရိယာအနီးအနားရှိ အချက်အလက်များကို မူလအချက်အလက် ကောက်ယူခြင်း (ကွင်းဆင်းစစ်တမ်းကောက်ယူမှုများ) နှင့် တဆင့်ခံအချက်အလက်များ (မြေပုံပေါ်ရှိ အချက်အလက်များ၊ ဒေသဆိုင်ရာအချက်အလက်များ) ကိုလေ့လာပြီးနောက် ကွင်းဆင်း လေ့လာခြင်းကို ပြုလုပ်ခဲ့ပါသည်။ အဆိုပြုစီမံကိန်းဧရိယာအကျယ်မှာ ၅၃.၇၈ ဧက (၂၁၈,၀၀၀ စတုရန်းမီတာ) ရှိ၍ စီမံကိန်းသည်ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့နယ်၊ ညောင်အင်းစက်မှုဇုန် (နိုင်ငံခြား)၊ လုပ်ကွက် ၃ မှ ၁၃ အထိရှိပါသည်။ စီမံကိန်း၏တည်နေရာမှာ မြောက်လတ္တီတွဒ် ၁၇ ° ၁၅ '၂၈.၆၅' ' နှင့် အရှေ့လောင်ဂျီတွဒ် ၉၆ ° ၂၇' ၁၃.၅၁ ' ' ကြားတွင်တည်ရှိပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် တွင် စီမံကိန်း ဧရိယာ၏ ၅၀၀ မီတာ ပတ်လည် အတွင်းတွင် အသေးစိတ် လေ့လာခဲ့ပါသည်။ အသေးစိတ် အချက်အလက်များကို အခန်း ၄ တွင်တင်ပြထားသည်။

၄.၁ မြေမျက်နှာသွင်ပြင်

စီမံကိန်းစက်ရုံသည် ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့နယ်၊ ညောင်အင်းစက်မှုဇုန် (နိုင်ငံခြား) တွင် တည်ရှိပြီး အများအားဖြင့်မြေပြန့်လွင်ပြင်များဖြင့်ဖွဲ့စည်းထားသောမြေအမျိုးအစားဖြစ်ပါသည်။

၄.၂ လေထုအရည်အသွေး

လေထုအရည်အသွေးတိုင်းတာခြင်းကို စက်ရုံ ဝန်းအတွင်းတွင် ၂၀၂၀၊ ဇူလိုင် ၁၄ ရက်မှ ၂၀၂၀ ဇူလိုင် ၁၅ ရက်ထိ ၂၄ နာရီကြာတိုင်းတာခဲ့ပါသည်။ တိုင်းတာမှုရလဒ်များအား အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လုပ်မှု) လမ်းညွှန်ချက်များ နှင့် နှိုင်းယှဉ်ဖော်ပြထားပါသည်။

၄.၂.၁ လေတိုက်ရာအရပ်နှင့် လေတိုက်နှုန်း

လေတိုက်ရာအရပ်နှင့် လေတိုက်ရာနှုန်းကို စက်ရုံ ဝန်းအတွင်းတွင် ၂၀၂၀၊ ဇူလိုင် ၁၄ ရက်မှ ၂၀၂၀ ဇူလိုင် ၁၅ ရက်ထိ ၂၄ နာရီကြာတိုင်းတာခဲ့ပါသည်။ တိုင်းတာမှုရလဒ်များအား အခန်း (၄) တွင် ဖော်ပြ ထားပါသည်။

၄.၃ တုန်ခါမှု

တုန်ခါမှု နှစ်မျိုးတိုင်းတာခဲ့ပြီး တိုင်းတာမှုများကို Portable Vibration ဖြင့် နေရာ (၆) တိုင်းတာခဲ့ပါသည်။ Nomis seismographs machine ဖြင့် စက်ရုံဝင်းအတွင်း၌ တုန်ခါမှုတိုင်းတာခဲ့ပြီး လုပ်သားများနှင့် အနီးအနားရှိရပ်ရွာလူထုအပေါ်သိသာထင်ရှားသောဆိုးကျိုးသက်ရောက်မှုများမရှိပါ။ ရလဒ်များကို အခန်း ၄ တွင် အသေးစိတ်ဖော် ပြထားသည်။

၄.၄ ဆူညံသံ

ဆူညံသံသည်လုပ်ငန်းလည်ပတ်ရာမှဖြစ်ပေါ်နိုင်သည်။ ထို့ကြောင့် ဒစ်ဂျစ်တယ် ဆူညံမှု တိုင်းတာသည့် ကိရိယာဖြင့် ၂၀၂၀၊ ဇူလိုင်လ ၁၄ရက်တွင် စက်ရုံအဆောက်အအုံနှင့် ခြံဝင်းတွင် တိုင်းတာ သည်။ ရလဒ်များသည် လုပ်သားများနှင့် အနီးအနားရှိရပ်ရွာလူထုအပေါ် သိသာထင်ရှားသော ဆိုးကျိုး သက်ရောက်မှုများမရှိပါ။ ရလဒ်များကို အခန်း ၄ တွင် အသေးစိတ်ဖော် ပြထားသည်။

၄.၅ ရေအရည်အသွေး

၂၀၂၀ ပြည့်နှစ်၊ ဇွန်လ ၂၄ ရက်နေ့တွင်စက်ရုံဝင်းအတွင်း နေရာ (၄) နေရာတွင်ရေနမူနာ ကိုကောက်ယူခဲ့သည်။ စက်ရုံအနေဖြင့်တိုင်းတာသော ရေအရည်အသွေး၏ ဓာတ်ခွဲခန်းရလဒ်မှာ သဘာဝ ပတ်ဝန်းကျင် ရေအရည်အသွေးထုတ်လွှတ်မှု လမ်းညွှန်ချက်နှင့် ကိုက်ညီကြောင်းတွေ့ရသည်။ TBS ကုမ္ပဏီ အနေဖြင့် တိုင်းတာသော ဓာတ်ခွဲခန်းမှ ရေ၏ အရည်အသွေးရလဒ်များကို အခန်း ၄ တွင် အသေးစိတ်ဖော် ပြထားပါသည်။

၄.၆ အလင်းရောင်

အလင်းရောင်သည်ခါတ်ခွဲခန်းနှင့် လုပ်ငန်းလည်ပတ်ရေးလုပ်ငန်းစဉ်အတွက် အရေးကြီးပါသည်။ ၂၀၂၀ ဇွန်လ ၂၄ ရက်နေ့တွင်အလင်းတိုင်းတာခြင်းကိုစက်ရုံတွင်း နေရာ (၅) နေရာတွင်ပြုလုပ်ခဲ့သည်။

တိုင်းတာမှုရလဒ်များကို IFC လမ်းညွှန်ချက်များနှင့်နှိုင်းယှဉ်ပြီး ရလဒ် များ သည် IFC လမ်းညွှန်ချက်များ နှင့် ကိုက်ညီရန်လိုအပ်သည်ကိုတွေ့ရှိရသည်။ရလဒ်များကို အခန်း ၄ တွင် အသေးစိတ်ဖော်ပြထား ပါသည်။

၄.၇ အပူချိန်

အပူချိန်တိုင်းတာမှုကို စက်ရုံတွင်း နေရာ (၁၀) နေရာတွင်ပြုလုပ်ခဲ့သည်။ ရလဒ်များကို IFC စံတန်ဖိုးနှင့်နှိုင်းယှဉ်သောအခါရလဒ်အားလုံးသည်စံအတွင်းတွင်ရှိသည်။ရလဒ်များကို အခန်း ၄ တွင် အသေးစိတ်ဖော်ပြထားပါသည်။

၄.၈ လမ်းအသုံးချမှု

စီမံကိန်းအနီးပတ်ဝန်းကျင်တွင် မြေအသုံးချမှုအားလေ့လာရာတွင် စက်မှုဇုန်ဧရိယာ၊ မြေလွတ် မြေရိုင်းဧရိယာ၊ စိုက်ပျိုးမြေဧရိယာ၊ လူနေထိုင်ရာဧရိယာ၊ လမ်းဧရိယာ၊ ရေထုဧရိယာ နှင့် သာသနာ့ နယ်မြေဧရိယာ ဟူ၍ လေ့လာတွေ့ရှိရပါသည်။ လေ့လာတွေ့ရှိချက်များအား အခန်း(၄) တွင် အသေးစိတ် ဖော်ပြထားပါသည်။

၅။ ဖြစ်ပေါ်နိုင်သော ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း

စီမံကိန်းစက်ရုံ လုပ်ငန်းလည်ပတ်စဉ်တွင် ပတ်ဝန်းကျင်အပေါ် အကျိုးသက်ရောက်မှုများ ဖြစ်ပေါ်နိုင်ပါသည်။ စက်ရုံလည်ပတ်စဉ်တွင် ဖြစ်ပေါ်နိုင်သော ပတ်ဝန်းကျင်ထိခိုက်မှုများမှာ လေထု ညစ်ညမ်းမှုဖြစ်ပေါ်နိုင်ခြင်း၊ အသံဆူညံခြင်း၊ လုပ်သားများမှ စွန့်ပစ်ရေထွက်ရှိခြင်း၊ စွန့်ပစ်အမှိုက်များ ထွက်ရှိခြင်းနှင့်လုပ်သားများထိခိုက်ဒဏ်ရာရရှိနိုင်ခြင်းတို့ဖြစ်ပါသည်။လျှော့ချရမည့်နည်းလမ်းများကို အခန်း (၅) တွင် အသေးစိတ်ဖော်ပြထားပါသည်။

၆။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်းနှင့် ပြည်သူတို့၏ပူးပေါင်းပါဝင်မှု

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်တွင် အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးပွဲ ပြုလုပ်ခြင်းမှာ လိုအပ်သော အခန်းကဏ္ဍတစ်ခု ဖြစ်ပါသည်။ အများပြည်သူနှင့် တွေ့ဆုံပွဲပြုလုပ်ခြင်း၏ ရည်ရွယ်ချက်မှာ အစိုးရဌာနဆိုင်ရာအဖွဲ့အစည်းများ၊ စီမံကိန်းကို စစ်ဆေးမည့်သူများနှင့် ပတ်ဝန်းကျင် ပြည်သူလူထုအား စီမံကိန်းမှ အချက်အလက်များဖြစ်သော ထုတ်လုပ်မှုအဆင့်ဆင့်များ၊ အမှိုက်စွန့်ပစ်မှု စနစ်များ နှင့် ပတ်ဝန်းကျင်အပေါ်အကျိုးသက်ရောက်မှုများကို ရှင်းလင်းတင်ပြရန် ဖြစ်ပါသည်။ သို့သော် ယခုအချိန်တွင် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရမှ အသက်ရှူလမ်းကြောင်းဆိုင်ရာရောဂါ Coronavirus Disease 2019 (COVID-19) ကူးစက်ပြန့်ပွားမှုမရှိစေရေးအတွက် အများပြည်သူများ အနေဖြင့် လူစုလူဝေးဖြင့် ကျင်းပပြုလုပ်ရမည့်အခမ်းအနားများ မပြုလုပ်ရန် အမိန့်ပြန်ကြားထားပါသည်။ ထို့ကြောင့် Myanmar Carlsberg Co., Ltd. ၏ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် အစီရင်ခံစာအတွက် အများပြည်သူ နှင့် တိုင်ပင်ဆွေးနွေးပွဲ မကျင်းပရသေးပါ။

ထို့ကြောင့် ပြည်ထောင်စုသမ္မတမြန်မာ နိုင်ငံတော်အစိုးရမှ ထိုကဲ့သို့တိုင်ပင် ဆွေးနွေးပွဲများ ပြန်လည်ခွင့်ပြုကြောင်း ထုတ်ပြန်သည့် အချိန်တွင် အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးပွဲအား ကျင်းပ လုပ်ဆောင်သွားမည်ဖြစ်ပြီး ထိုဆွေးနွေးပွဲမှ ရရှိလာသော သဘောထားမှတ်ချက်များနှင့် အကြံပြု ဆွေးနွေးချက်များကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်တွင် ပြန်လည်ထည့်သွင်း ရေးသားသွားမည် ဖြစ်ပါသည်။

၇။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များ

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ရေးဆွဲခြင်း၏ ရည်ရွယ်ချက်မှာ စီမံကိန်း အကောင်အထည် ဖော်ဆောင်မှုကြောင့် ဖြစ်ပေါ်နိုင်သော ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ နှင့် လျော့ချရေး အစီအစဉ် များကို လေ့လာသည့် အဓိကအခန်းကဏ္ဍ ဖြစ်ပါသည်။ လေ့လာမှုမှ တွေ့ရှိသော အကျိုးဆက် များကို ကောင်းကျိုး၊ ဆိုးကျိုးများ ခွဲခြားပြီး ကောင်းကျိုးများကို ပိုမိုကောင်းမွန်အောင် ဆောင်ရွက်ရန်နှင့် ဆိုးကျိုးများကို လျော့ချနိုင်ရန် အစီအစဉ်များ ရေးဆွဲခြင်းဖြစ်ပါသည်။

Plan (P)- အစီအစဉ်ရေးဆွဲခြင်း

စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်အပေါ်ထိခိုက်မှု ဖြစ်စေနိုင်သော လေထုညစ်ညမ်းမှု၊ အသံ ဆူညံမှု၊ ရေဆိုးစွန့်ပစ်မှု၊ အမှိုက်စွန့်ပစ်မှု၊ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းမှု စသော ထိခိုက်မှုများ လျော့ပါးရေး အတွက် အချိန်ဇယား အစီအစဉ်များ ရေးဆွဲရပါမည်။

Do (D)- အကောင်အထည်ဖော်ဆောင်ခြင်း

ပတ်ဝန်းကျင်ထိခိုက်မှု အတွက် ရေးဆွဲထားသော လျော့ချရေး အစီအစဉ်များကို စီမံကိန်းမှ တာဝန်ရှိသူများက အကောင်အထည်ဖော် ဆောင်ရွက်ပါမည်။

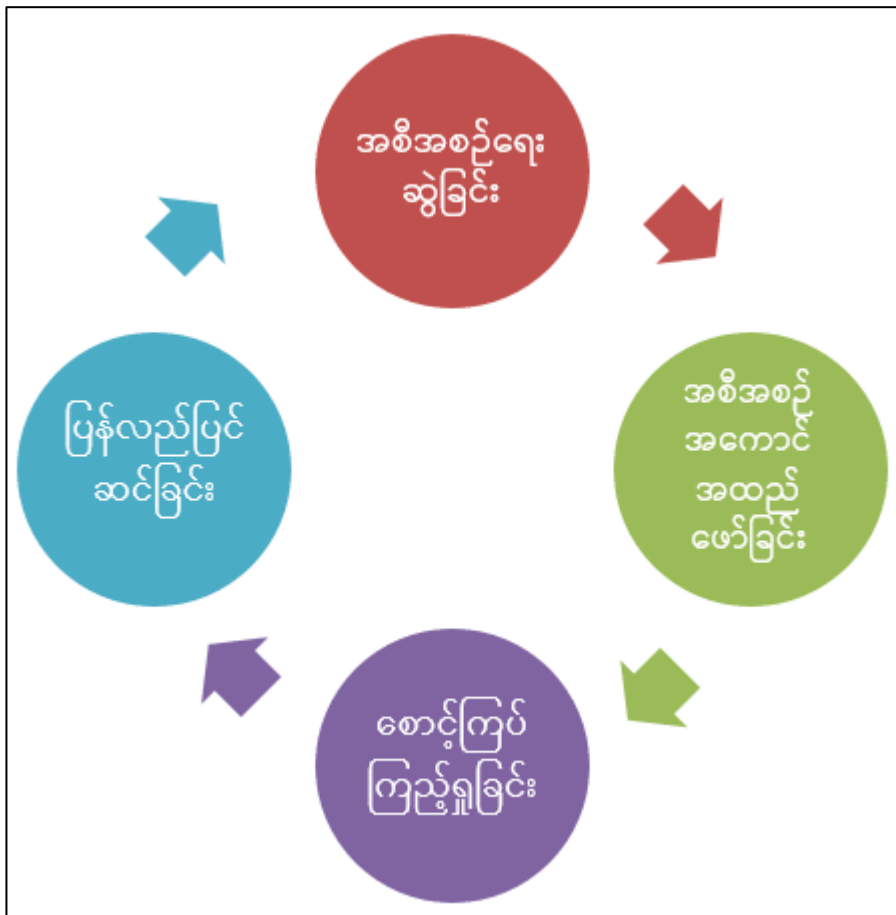
Check (C)- စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် စစ်ဆေးခြင်း

လျော့ချရေးအစီအစဉ်များ အကျိုးသက်ရောက်မှု ရှိ၊ မရှိကို စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် စစ်ဆေးခြင်းများ ပြုလုပ်ရပါမည်။ စောင့်ကြည့်မှုအတွက် စီမံကိန်းဖော်ဆောင်သူ အပါအဝင် သက်ဆိုင်ရာ အနီးပတ်ဝန်းကျင်ရှိ ပုဂ္ဂိုလ်များ၊ အုပ်ချုပ်ရေးပိုင်းဆိုင်ရာ တာဝန်ရှိပုဂ္ဂိုလ်များ အစရှိသော သက်ဆိုင်ရာ အဖွဲ့အစည်းများ စုပေါင်း၍ လေ့လာစောင့်ကြည့်မှု ပြုလုပ်ရပါမည်။ ၎င်းစောင့်ကြည့်မှုကို လည်း အစီရင်ခံစာ ပြုစုပြီး သက်ဆိုင်ရာ ဝန်ကြီးဌာနသို့ တင်ပြရမည်ဖြစ်သည်။

Act (A)- ပြန်လည်ပြင်ဆင်ခြင်း

စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်တွင် လက်ရှိဖြစ်ပေါ်သော ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု များနှင့် ကိုက်ညီမှုမရှိခဲ့လျှင် လျော့ချရေး အစီအစဉ်များကို ပြန်လည်ပြင်ဆင်ခြင်းများ ပြုလုပ်ရပါမည်။

စီမံကိန်းလုပ်ငန်းများကြောင့် ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု မရှိစေရန် သက်ဆိုင်ရာ အာဏာပိုင် အဖွဲ့အစည်းများ၏ ချမှတ်ထားသော သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ဥပဒေ၊ စည်းမျဉ်းများ နှင့်အညီ သင့်လျော်သော လျှော့ချရေးအစီအစဉ်များကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း ဖြစ်ပါသည်။ ထိုသို့ အကောင်အထည်ဖော် ဆောင်ရွက်ရာ၌ အောက်တွင် ဖော်ပြထားသော စက်ဝိုင်းပုံ အတိုင်း စီမံခန့်ခွဲမှုအစီအစဉ် Plan-Do-Check-Act (P.D.C.A) အချက်လေးချက်ပေါ် မူတည်ပြီးပြု လုပ်ရပါမည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ပြစက်ဝိုင်းကို ပုံ ၃ တွင်ဖော်ပြထားပါသည်။



ပုံ ၃ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပြစက်ဝိုင်း

၇.၁ ပတ်ဝန်းကျင် နှင့် လူမှုထိခိုက်မှုများ

၇.၁.၁ တည်ဆောက်ရေးကာလ

(က) လေထုအရည်အသွေး

တည်ဆောက်မှုအဆင့်တွင် ကွန်ကရစ်ရောစပ်ခြင်း၊ ကွန်ကရစ်လောင်းခြင်း၊ မြေတူးခြင်း၊ ယာဉ်လည်ပတ်ခြင်းစသည့် ဆောက်လုပ်ရေးလုပ်ငန်းများမှ ဖုန်မှုန့်များထုတ်လွှတ်နိုင်ပါသည်။ ထို့အပြင် လေထုညစ်ညမ်းမှုကို စက်ယန္တရားများလည်ပတ်ရာမှ ထွက်ရှိသော မီးခိုးငွေ့များနှင့် အစိုင်အခဲ စွန့်ပစ် ပစ္စည်းများကို လောင်ကျွမ်းခြင်းတို့မှ တွေ့ရှိနိုင်ပါသည်။ ပိတ်သိမ်းမှုအဆင့်လုပ်ငန်းကို အသေးစား

ဆောက်လုပ်ရေးလုပ်ငန်းအဖြစ် သတ်မှတ်နိုင်သည်။ ထို့ကြောင့်လေထုညစ်ညမ်းမှုသည် တည်ဆောက်ရေးကာလနှင့် နှိုင်းယှဉ်လျှင် လျော့နည်းပါသည်။

(ခ) ဆူညံသံ နှင့် တုန်ခါမှု

ဆောက်လုပ်မှုအဆင့်တွင် လေးလံသော စက်ကိရိယာများနှင့် မြေတူးဖော်ခြင်း စက်ကိရိယာများလည်ပတ်ခြင်းကြောင့် ပတ်ဝန်းကျင်အားဆူညံသံနှင့် တုန်ခါမှုဖြစ်ပေါ်စေနိုင်သည်။ ဤဆူညံသံနှင့် တုန်ခါမှုများမှာအကန့်အသတ်ရှိမည်ဖြစ်ပြီး စီမံကိန်းသည် စက်မှုဇုန်တွင် တည်ရှိသောကြောင့် ပတ်ဝန်းကျင်နှင့် ဒေသခံလူထုအပေါ်အကျိုးသက်ရောက်မှုအနည်းငယ်သာရှိသည်။

(ဂ) ရေအရည်အသွေး

ဆောက်လုပ်ရေးနှင့် ပိတ်သိမ်းရေးကာလတွင် ဆောက်လုပ်ရေးလုပ်သားအားလုံးအတွက် လိုအပ်သောရေကို မြေအောက်ရေ(အဝီစိတွင်းများ)မှ အသုံးပြုမည်ဖြစ်ပါသည်။ သို့သော် ဆောက်လုပ်ရေးလုပ်ငန်းများမှ စွန့်ပစ်ရေအလွန်အကျွံမထွက်ရှိနိုင်ပါ။ ဆောက်လုပ်ရေးလုပ်သား အရေအတွက်ပေါ်မူတည်၍ ရေဆိုးအနည်းငယ်ကိုသာ ထုတ်လုပ်သည်။ ဆောက်လုပ်ရေးလုပ်ငန်းမှ ထွက်ရှိသော ရေဆိုးများသည် အိမ်သာနှင့် အခြားရေအသုံးပြုမှုတို့မှထွက်ရှိပါသည်။ ထို့ကြောင့် ရေထုထည်ပမာဏအလွန်နည်းပါးပြီး သဘာဝပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုနည်းပါးသည်။

(ဃ) စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများ

စွန့်ပစ်ပစ္စည်းများသည် စက်ရုံတည်ဆောက်မှုနှင့်ပြန်လည်ပိတ်သိမ်းမှုအဆင့်တို့တွင် ထွက်ရှိနိုင်ပါသည်။ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကိုယာယီအဆောက်အအုံများဖယ်ရှားခြင်းနှင့် အခြားဆောက်လုပ်ရေး လုပ်ငန်းများမှထွက်ရှိနိုင်ပါသည်။ အခြားအန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများမှာ ပလတ်စတစ်၊အမှိုက်၊ဖန်၊အစားအစာစွန့်ပစ်ပစ္စည်းများနှင့်လုပ်သားများမှစွန့်ပစ်သောစွန့်ပစ်ပစ္စည်းများဖြစ်ပါသည်။

အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ

ဆောက်လုပ်ရေးလုပ်ငန်းများမှ စွန့်ပစ်ပစ္စည်းများမှာ ကွန်ကရစ်အပိုပစ္စည်းများ၊ ကတ္တရာ၊ ညစ်ညမ်းသော မြေဆီလွှာများ၊ စက်သုံးဆီနှင့် လောင်စာဆီအကြွင်းအကျန်များ၊ အသုံးပြုပြီးသောဓါတ်ခဲ၊ ဘတ္တရီများ စသည်တို့ဖြစ်ကြပါသည်။

ဖော်ပြပါ စွန့်ပစ်ပစ္စည်းများကြောင့် ပတ်ဝန်းကျင်အပေါ် အကျိုးသက်ရောက်မှုများ ဖြစ်ပေါ်စေနိုင်သော်လည်း သက်ရောက်မှုအတိုင်းအတာမှာ အနည်းငယ်သာရှိသည်။

(င) မြေအသုံးပြုမှု

အခြေခံအဆောက်အအုံများနှင့် စက်ကိရိယာများတပ်ဆင်ခြင်းကို အကောင်အထည်ဖော်ရန် အတွက် စီမံကိန်းဧရိယာတဝိုက်တွင် အပင်များနှင့် အပေါ်ယံမြေဆီလွှာများဖယ်ရှားခြင်းအပါအဝင် နေရာ ရှင်းလင်း ရေးကိုဆောင်ရွက်ခဲ့သည်။ သို့သော် စီမံကိန်းစက်ရုံကြောင့် မြေအသုံးချမှု ပြောင်းလဲခြင်း သည် ပတ်ဝန်းကျင်အပေါ် အတန်အသင့်သက်ရောက်မှုရှိသည်ဟု ယူဆနိုင်ပါသည်။

(စ) မြေဆီလွှာအရည်အသွေး

စီမံကိန်းစက်ရုံအတွက် ဆောက်လုပ်ရေးနှင့်ပိတ်သိမ်းမှုလုပ်ငန်းများသည် လောင်စာဆီ ယိုစိမ့်မှု ကဲ့သို့သော မြေဆီလွှာညစ်ညမ်းမှုကိုဖြစ်ပေါ်စေနိုင်ပါသည်။

(ဆ) ယဉ်ကျေးမှုအမွေအနှစ်

စက်ရုံဆောက်လုပ်သည့်နေရာသည် ပဲခူးတိုင်းဒေသကြီးစက်မှုဇုန်တွင် တည်ရှိသည်။ ထို့ကြောင့် ရှေးဟောင်းသုတေသနနေရာများ၊ ရိုးရာအဆောက်အအုံနှင့် အထိမ်းအမှတ်အဆောက်အအုံများကဲ့သို့သော ယဉ်ကျေးမှုအမွေအနှစ်များတည်ရှိခြင်းမရှိပါ။

(ဇ) ဂေဟစနစ်

စီမံကိန်းသည် စက်မှုဇုန်ဧရိယာတွင်တည်ရှိသောကြောင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဧရိယာများ၊ ထိန်းသိမ်းထားသောသစ်တောများနှင့်စိုစွတ်သောဧရိယာများ၊ စက်ရုံဧရိယာအနီးရှိအမျိုးသား ဥယျာဉ်များနှင့်ပတ်ဝန်းကျင်ဂေဟစနစ်အပေါ်သိသာသောသက်ရောက်မှုမရှိပါ။

(ဈ) ကျန်းမာရေးနှင့် လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေး

ဆောက်လုပ်ရေးနှင့်ပိတ်သိမ်းမှုအဆင့်တွင်ကျန်းမာရေးနှင့်ဘေးကင်းရေးအပေါ်သက်ရောက်နိုင် သောအကြောင်းအရာများကိုအောက်တွင်ဖော်ပြထားသည်။

- ကျွမ်းကျင်မှုမရှိသောအလုပ်သမားများကြောင့်မတော်တဆမှုများဖြစ်ခြင်း။
- လုပ်ငန်းခွင်အတွင်းအမြင့်နေရာများတွင် PPE မပါဘဲအလုပ်လုပ်ခြင်း။
- ပစ္စည်းကိရိယာများ၏မျက်နှာပြင်အပူချိန်တိုးလာခြင်း။
- လုပ်ငန်းခွင်နှင့်အနီးပတ်ဝန်းကျင်လေထုအတွင်းတွင်ဖုန်မှုန့်များဖြစ်ပေါ်ခြင်း။
- စက်ယန္တရားများရွေ့လျားခြင်းနှင့်ဆောက်လုပ်ရေးလုပ်ငန်းသုံးယာဉ်များကြောင့်မတော်တဆမှုနှင့် အန္တရာယ်များဖြစ်စေနိုင်ခြင်း။
- ဆောက်လုပ်ရေးလုပ်ငန်းခွင်တွင်အသုံးပြုမည့်အန္တရာယ်ရှိသောပစ္စည်းများနှင့်ကိုင်းတယ်ခြင်းသို့မ ဟုတ်ထိတွေ့ခြင်းမှအန္တရာယ်ရှိနိုင်ခြင်း။

(ည) လူမှုစီးပွားရေး

အလုပ်အကိုင်အခွင့်အလမ်းများကြောင့် ဒေသခံပြည်သူများအပေါ်အပြုသဘော အကျိုး သက်ရောက်မှု များရှိလာမည် ဖြစ်သည်။ စက်ရုံတည်ဆောက်ခြင်းနှင့် ပိတ်သိမ်းခြင်းအဆင့်များတွင် ဒေသတွင်းရှိဆိုင်များမှပစ္စည်းကိရိယာများကိုဝယ်ယူနိုင်သည်။ထို့ကြောင့်ဒေသခံပြည်သူများ၏အသက်မွေး ဝမ်းကျောင်းမှုအပေါ်အပြုသဘောဆောင်သောအကျိုးသက်ရောက်မှုများရှိနိုင်ပါသည်။

၇.၁.၂ လုပ်ငန်းလည်ပတ်စဉ်ကာလ

(က) လေထုအရည်အသွေး

လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း ကုန်ကြမ်းပစ္စည်းများ အတင်အချပြုလုပ်ခြင်းနှင့် သန့်ရှင်းရေး လုပ်ငန်းများမှ ထွက်သောဖုန်မှုန့်များသည် လေထုညစ်ညမ်းမှုကိုဖြစ်စေနိုင်သည်။ ထို့အပြင် မီးစက်များ၊ ကုန်ကြမ်းများသယ်ယူပို့ဆောင်ခြင်း၊ဘီယာထုတ်လုပ်မှုအတွက်စွမ်းအင်သုံးစွဲမှုနှင့်အရေးပေါ်မီးစက်များအ သုံးပြုခြင်းကြောင့်CO₂, NO₂, CO, CH₄, O₃, PM₁₀, PM_{2.5}, SO₂, VOCs စသည့်အမှုန်များ ထုတ်လွှတ် နိုင်သည်။ သို့သော်မီးစက်နှင့်မော်တော်ယာဉ်လှုပ်ရှားမှုသည် အချိန်တို လေးသာကြာမည် ဖြစ်သောကြောင့် အန္တရာယ်ရှိသောအဆင့်ထိလေထုညစ်ညမ်းမှုကို မဖြစ်စေပါ။ ဤစက်ရုံ၏ လေထုအရည်အသွေးမှာ သတ်မှတ်စံနှုန်းထက်ကျော်သော်လည်း စက်မှုဇုန်တွင်တည်ရှိသောကြောင့် အနီးပတ်ဝန်းကျင်သို့ သိသာစွာ သက်ရောက်မှုမရှိပါ။

(ခ) ဆူညံသံ နှင့် တုန်ခါမှု

လုပ်ငန်းလည်ပတ်နေစဉ်အတွင်း ဆန်နှင့်မုယောစပါးကြိတ်ခွဲခြင်းကဲ့သို့သော ကုန်ထုတ်လုပ်မှု ဖြစ်စဉ်များကြောင့် ပတ်ဝန်းကျင်အားဆူညံသံနှင့် တုန်ခါမှုကိုဖြစ်စေနိုင်သည်။ သို့သော်ပမာဏသည် အကန့်အသတ်ဖြင့်သာရှိနိုင်ပါသည်။

(ဂ) ရေအရည်အသွေး

လုပ်ငန်းလည်ပတ်နေစဉ်အတွင်း ဘီယာထုတ်လုပ်မှုလုပ်ငန်းစဉ်များမှ မသန့်ရှင်းသော စွန့်ပစ် ပစ္စည်းများနှင့် စွန့်ပစ်ရေများသည် ရေထုညစ်ညမ်းမှုကိုဖြစ်စေနိုင်သည်။ သို့ရာတွင် စက်ရုံသည် စွန့်ပစ်ရေ ကို စက်ရုံမှတည်ဆောက်ထားသော အညစ်အကြေးစွန့်ပစ်စက်များနှင့် စနစ်တကျ သန့်စင်ပြီးမှ အနီး ပတ်ဝန်းကျင်သို့ စွန့်ထုတ်သောကြောင့် သိသာစွာသက်ရောက်မှုမရှိပါ။

(ဃ) စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

စက်ရုံမှအစိုင်အခဲစွန့်ပစ်ပစ္စည်း

စီမံကိန်းဧရိယာတွင် လေ့လာမှုအရ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို ပဲခူးမြို့နယ်စည်ပင် နှင့် ချိတ်ဆက်ပြီး ပုံမှန်စွန့်ပစ်ပါသည်။ ထို့အပြင် အသုံးပြုပြီးသော စွန့်ပစ်ပစ္စည်းများ၊ သစ်သားပုံးများနှင့်

ပလပ်စတစ်ကန်ဒုံးများကဲ့သို့သော ထုပ်ပိုးသည့် အမှိုက်များကိုပြန်လည် အသုံးပြု ပါသည်။ စက်မှု စွန့်ပစ် ပစ္စည်းများကို စီမံကိန်းအဆိုပြုသူမှ ကောင်းစွာစီမံခန့်ခွဲသောကြောင့် ပတ်ဝန်းကျင် အပေါ်ဆိုးကျိုး သက်ရောက်နိုင်ခြေနည်းပါသည်။

(င) မြေဆီလွှာအရည်အသွေး

လုပ်ငန်းလည်ပတ်စဉ်ကာလအတွင်း မြေဆီလွှာညစ်ညမ်းမှု ဖြစ်စေနိုင်ပါသည်။ ဥပမာအားဖြင့် လောင်စာဆီယိုစိမ့်ခြင်းနှင့် အခြားမြေပေါ်အမှိုက်သရိုက်များကြောင့် ညစ်ညမ်းမှုဖြစ်ပေါ်နိုင်သော်လည်း သိသာသက်ရောက်မှုမရှိပါ။

(စ) အနံ့ဆိုး

လုပ်ငန်းလည်ပတ်နေစဉ်ကာလအတွင်း ကစော်ဖောက်ခြင်း ဖြစ်စဉ်ကဲ့သို့သောကုန်ထုတ်လုပ်မှု ဖြစ်စဉ်များသည် အနံ့ဆိုးကိုဖြစ်စေနိုင်သည်။ ဤစက်ရုံသည်စက်မှုဇုန်တွင်တည်ရှိသောကြောင့် အကျိုး သက်ရောက်မှုမှာ အနီးပတ်ဝန်းကျင်သို့သိသာစွာ သက်ရောက်မှုမရှိပါ။

(ဆ) ဂေဟစနစ်

မသန့်ရှင်းသောစွန့်ပစ်ရေနှင့် ထုတ်လုပ်မှုဖြစ်စဉ်များမှ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို စနစ်တကျမစွန့်ပစ်ခြင်းကြောင့် အနီးပတ်ဝန်းကျင်ရှိရေနေဂေဟစနစ်နှင့် အပင်များ၊ သတ္တဝါများ၏ ကျက်စားရာ နေရာများအပေါ်ဆိုးကျိုးသက်ရောက်နိုင်သည်။ သို့ရာတွင်စက်ရုံသည် စွန့်ပစ်ရေနှင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို စနစ်တကျစီမံခန့်ခွဲသောကြောင့်ဖြစ်နိုင်ခြေမရှိပါ။

(ဇ) ကျန်းမာရေးနှင့် လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေး

စက်ရုံသည်သဘာဝအလင်းရောင်ရရှိရန်အတွက် အလင်းဝင်ပေါက်များကို အသုံးပြုပါသည်။ လုပ်ငန်းလည်ပတ်ချိန်တွင် အလုပ်သမားများ၏လုပ်ဆောင်ချက်များသည် အလင်း၏အရည်အသွေးပေါ် မူတည်သည်။ ထို့ကြောင့်ထုတ်လုပ်ရေးလုပ်ငန်းခွင်များသို့ လုံလောက်သော အလင်းရောင်ပေးရန် လိုအပ်သည်။ ထို့အပြင် စက်ပစ္စည်းများနှင့် ကိရိယာများကိုမလျော်ကန်သော အသုံးပြုမှုကြောင့် မတော်တဆမှုများ၊ လျှပ်စစ်အန္တရာယ်နှင့် အခြားသောလုပ်ငန်းခွင်အတွင်း ရုပ်ပိုင်းဆိုင်ရာထိခိုက်မှုများ ဖြစ်ပေါ်နိုင်ပါသည်။

(ဈ) လူမှုစီးပွား

စီမံကိန်း၏ လည်ပတ်မှုအဆင့်များတွင် အလုပ်အကိုင်အခွင့်အလမ်းများ ပိုမိုဖန်တီး ပေးသောကြောင့် လူမှုစီးပွားဆိုင်ရာ ကောင်းကျိုးသက်ရောက်မှုများကို ရရှိနိုင်ပါသည်။ စီမံကိန်း အဆိုပြုသူ သည် လုပ်ငန်းလည်ပတ်ချိန်တွင် အောက်ပါ အလေ့အကျင့်များကို အကောင်အထည် ဖော်ဆောင်ပါမည် -

- အလုပ်သမားများအား မျှတသောဆက်ဆံမှု၊ တစ်နည်းအားဖြင့် ခွဲခြားဆက်ဆံမှု မရှိစေရန်နှင့်တန်းတူညီမျှအခွင့်အရေးရရန်အားပေးခြင်း။
- စီမံကိန်းအဆိုပြုသူသည် ထုတ်လုပ်မှုစွမ်းရည်ကိုတိုးမြှင့်ရန်စီစဉ်နေပြီး စက်ရုံအတွက် လုပ်သားအင်အား အရင်းအမြစ်လိုခြင်းကြောင့် အနီးအနားရှိရပ်ရွာလူထုများသည် အကျိုးကျေးဇူးရရှိလိမ့်မည်။
- အမျိုးသားအလုပ်သမား၊ အလုပ်အကိုင်ဆိုင်ရာဥပဒေများနှင့်အညီ အတိအကျ လိုက်နာမှု ရှိစေရန်။
- ကန်ထရိုက်တာများနှင့် ထောက်ပံ့သူများမှ အလုပ်သမားများအပေါ် ပိုမိုဈေးကွက် အမြတ်ထုတ်ခြင်း ကို ရှောင်ရှားရန်။
- အန္တရာယ်ကင်းပြီး ကျန်းမာသောလုပ်ငန်းခွင်အခြေအနေများမြှင့်တင်ရန်။
- စီမံကိန်းအဆိုပြုသူသည် အပြုသဘောသက်ရောက်မှုများကိုတိုးမြှင့်ခြင်းနှင့် အပျက် သဘောဆောင်သောသက်ရောက်မှုများကိုလျှော့ချရန်ကြိုးစားခြင်း။

၇.၂ စောင့်ကြပ်ကြည့်ရှုရေးအစီအစဉ်များ

စီမံကိန်းလုပ်ငန်းတွင် အဓိက စောင့်ကြပ်ကြည့်ရှုရမည့် အကြောင်းအရာများမှာ လေထု ညစ်ညမ်းမှု၊ အသံဆူညံမှု၊ အမှိုက်စွန့်ပစ်မှု၊ လုပ်သားများ၏ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းမှု တို့ကို စောင့်ကြပ်ကြည့်ရှုရပါမည်။ လုပ်ငန်းစဉ်များကို ဇယား (၂) တွင်ဖော်ပြထားပါသည်။ စောင့်ကြပ်ကြည့်ရှု ရခြင်း၏ ရည်ရွယ်ချက်မှာ (၁) စီမံကိန်းလုပ်ငန်း လည်ပတ်နေစဉ်အတွင်း ဖြစ်ပေါ်နိုင်သော ထိခိုက်မှုများကို တိုင်းတာရန်၊ (၂) ပြဌာန်းထားသော ဥပဒေအတိုင်း လုပ်ဆောင်စေရန်၊ (၃) ပတ်ဝန်းကျင်အပေါ် ထိခိုက်နိုင်မှု များအတွက် လျှော့ချရေးနည်းလမ်းများ သတ်မှတ်ရန်၊ (၄) ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ပြည့်စုံစွာဖော်ပြနိုင်ရန် တို့ဖြစ်ပါသည်။ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်တွင် ပြုလုပ်ရမည့်အချက်များ၊ စောင့်ကြည့်ရမည့်နေရာ၊ အချိန်ကာလနှင့် တာဝန်ယူမည့် အဖွဲ့အစည်းတို့ ပါဝင်ပါသည်။ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်နှင့် စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ် အသေးစိတ်ကို အခန်း (၇) တွင် ဖော်ပြထား ပါသည်။

ဇယား (၂) စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်

စောင့်ကြပ်ကြည့်ရှုရမည့် အကြောင်းအရာများ	စောင့်ကြပ်ကြည့်ရှုရမည့် အမျိုးအစားများ	လိုက်နာရမည့် အချက်များ	စောင့်ကြပ်ကြည့်ရှုရမည့် နေရာ	အကြိမ် အရေအတွက်	ခန့်မှန်းအသုံးစရိတ် (ကျပ်)	တာဝန်ယူရမည့်အဖွဲ့အစည်း
လေထုအရည်အသွေး	CO ₂ , CO, CH ₄ , NO ₂ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂ , VOCs	အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေးထုတ်လုပ်မှု လမ်းညွှန်ချက် နှင့် နိုင်ငံတကာ စံချိန်စံညွှန်းများ အတွင်း	မီးစက်၊ လုပ်ငန်းခွင် အတွင်း	လုပ်ငန်းဆောင်ရွက် နေစဉ် တစ်နှစ် (၂) ကြိမ်	၂,၀၀၀,၀၀၀	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအရည် အသွေးစောင့်ကြည့်ရေးအဖွဲ့
ဆူညံသံ	ဆူညံမှု (dB(A) scale)	အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေးထုတ်လုပ်မှု လမ်းညွှန်ချက် နှင့် နိုင်ငံတကာ စံချိန်စံညွှန်းများ အတွင်း	လုပ်ငန်းခွင် အတွင်း	လုပ်ငန်းဆောင်ရွက် နေစဉ် တစ်နှစ် (၂) ကြိမ်	၁,၀၀၀,၀၀၀	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအရည် အသွေးစောင့်ကြည့်ရေးအဖွဲ့
တုန်ခါမှု	Radial, Transverse, Vertical	အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေးထုတ်လုပ်မှု လမ်းညွှန်ချက် နှင့် နိုင်ငံတကာ စံချိန်စံညွှန်းများ အတွင်း	လုပ်ငန်းခွင် အတွင်း	လုပ်ငန်းဆောင်ရွက်နေစဉ် တစ်နှစ် (၂) ကြိမ်	၁,၀၀၀,၀၀၀	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအရည် အသွေးစောင့်ကြည့်ရေးအဖွဲ့
စွန့်ပစ်အမှိုက်	လုပ်ငန်းခွင်မှ ထွက်ရှိသော အမှိုက်များ၊ ပစ္စည်းထုပ်ပိုး ရာမှ ထွက်ရှိ လာသော အမှိုက်များ၊ ဝန်ထမ်းများ အသုံးပြုရာမှ ထွက်ရှိလာ သောအမှိုက် များ၊ စက္ကူ၊ ရုံးသုံး အမှိုက်များ	အမှိုက်ထွက်ရှိနှုန်း (ton or kg)	အမှိုက်ပုံး၊ ယာယီ အမှိုက် စွန့်ပစ်ကန်	နှစ်စဉ်	၂,၀၀၀,၀၀၀	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအရည် အသွေးစောင့်ကြည့်ရေးအဖွဲ့
စွန့်ပစ်ရေ	လုပ်သားများအသုံးပြုသည့် အဆင့် နှင့်	အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေးထုတ်လုပ်မှု	စက်ရုံဝင်းအတွင်းရှိ ရေမြောင်းနှင့်	နှစ်စဉ်	၁,၀၀၀,၀၀၀	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအရည် အသွေးစောင့်ကြည့်ရေးအဖွဲ့

စောင့်ကြပ်ကြည့်ရှု ရမည့် အကြောင်းအရာများ	စောင့်ကြပ်ကြည့်ရှုရမည့် အမျိုးအစားများ	လိုက်နာရမည့် အချက်များ	စောင့်ကြပ်ကြည့်ရှုရမည့် နေရာ	အကြိမ် အရေအတွက်	ခန့်မှန်းအသုံးစရိတ် (ကျပ်)	တာဝန်ယူရမည့်အဖွဲ့အစည်း
	ကုန်ထုတ်လုပ်ငန်းများမှ စွန့်ပစ်ရေ	လမ်းညွှန်ချက် နှင့် နိုင်ငံတကာ စံချိန်စံညွှန်းများ အတွင်း	စက်ရုံစွန့်ပစ်ရေ စွန့်ထုတ်ရာ ရေမြောင်း			
လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး	မတော်တဆ ထိခိုက်မှု မှတ်တမ်းများ	ဘေးအန္တရာယ်ကင်းရှင်းရန်၊ ဝန်ထမ်းများအား လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်း ရေး သင်တန်းများ သင်ကြားခြင်း၊ လူမှုကူညီရေးအဖွဲ့များ ထားရှိခြင်း	စက်ရုံ နှင့် လုပ်ငန်း ဆောင်ရွက်သော နေရာများ	နှစ်စဉ်	၅,၀၀၀,၀၀၀	လုပ်ငန်းခွင်ဘေးကင်းလုံခြုံရေးအဖွဲ့

၇.၃ ရံပုံငွေလျာထားခြင်း

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်တွင် ပတ်ဝန်းကျင် စောင့်ကြပ်ကြည့်ရှုမှု၊ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာအစီအစဉ်များအတွက် သုံးစွဲမည့် တစ်နှစ်တာအတွက် ခန့်မှန်း စရိတ်များကို ဇယား ၃ တွင် ဖော်ပြထားပါသည်။

ဇယား ၃ ပတ်ဝန်းကျင်ဆိုင်ရာ အစီအစဉ်များအတွက် နှစ်စဉ် ခန့်မှန်းအသုံး စရိတ်များ

စဉ်	ပတ်ဝန်းကျင်လျော့ချရေးအတွက်ပြုလုပ်မည့်အစီအစဉ်များ	ခန့်မှန်းအသုံးစရိတ် (ကျပ်)
ပတ်ဝန်းကျင်ဆိုင်ရာလုပ်ငန်းများ		
၁	ပတ်ဝန်းကျင်အရည်အသွေးတိုင်းတာခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း	၇,၀၀၀,၀၀၀
၂	အရေးပေါ်အခြေအနေ	၅၀၀,၀၀၀
၃	သက်ဆိုင်ရာသင်တန်းများပို့ချခြင်း	၅၀၀,၀၀၀
ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာလုပ်ငန်းများ		
၄	လုပ်ငန်းခွင်သုံး ကာကွယ်ရေးပစ္စည်း	၃,၀၀၀,၀၀၀
၅	ကျန်းမာရေး အထောက်အပံ့ပစ္စည်းများ	၅၀၀,၀၀၀
၆	မီးသတ်ပစ္စည်းများ	၅၀၀,၀၀၀

၈။ နိဂုံး

နိဂုံးချုပ်အနေဖြင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်လေ့လာမှုတွင် အောက်ဖော်ပြပါ အချက်များကို သတ်မှတ်ဖော်ပြ ထားပါသည်။

- ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အစီရင်ခံစာအပေါ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာနမှ ချမှတ်လိုက်သောမှတ်ချက်များနှင့်အကြံပေးချက်များကို စီမံကိန်းဖော်ဆောင်သူဘက်မှ လိုက်နာမည်ဖြစ်ပါသည်။
- တာဝန်ရှိသူများမှ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကိုခွင့်ပြုပြီးပါက စီမံကိန်း ဖော်ဆောင်သူမှ တိကျစွာအကောင်အထည်ဖော်ဆောင်ရွက်ပါမည်။
- ပြည့်စုံကောင်းမွန်သောပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် အစီရင်ခံစာဖြစ်ရန်အတွက် စီမံကိန်း ဖော်ဆောင်သူနှင့် ဒေသဆိုင်ရာအာဏာပိုင်များ၏နားလည်မှုနှင့် အထောက်အပံ့များသည် အရေးကြီးပါသည်။
- အရည်အချင်းနှင့် ဗဟုသုတကြွယ်ဝ၍ အတွေ့အကြုံရှိသော HSE မန်နေဂျာများနှင့် လက်ထောက် HSEတာဝန်ခံများကို ခန့်အပ်ထားရှိပါသည်။

- ယခု ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်အပေါ်မူတည်၍ နေ့စဉ်၊ လစဉ်နှင့် နှစ်စဉ် ဆောင်ရွက်မှု အစီအစဉ်များကို တိကျစွာ အကောင်အထည် ဖော်ဆောင်ထားပါသည်။ ထို့အတူလုပ်ငန်း လည်ပတ်သည့် ကာလတွင်လည်း ထိုအစီအစဉ်များကို အကောင်အထည်ဖော်ဆောင်ထားပါသည်။
- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုလုပ်ငန်းများကို မှတ်တမ်းတင်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီး ဌာနသို့ တင်ပြခြင်းလုပ်ငန်းများဆောင်ရွက်သွားပါမည်။
- တတိယအဖွဲ့အစည်း၏အစီရင်ခံစာနှင့်မှတ်ချက်များကို လိုက်နာပါမည်။
- ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်မှ ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်ဆိုင်ရာဥပဒေ၊ စည်းမျဉ်းများနှင့် ညွှန်ကြားချက်များကို လိုက်နာပါမည်။

ထို့ကြောင့် စီမံကိန်းအကောင်အထည် ဖော်ဆောင်ရွက်သူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် အစီအရင်ခံစာတွင်ပါရှိသည့် အဆိုပြု အချက်အလက်များကို အပြည့်အဝ လိုက်နာဆောင်ရွက် အကောင်အထည်ဖော်ဆောင်မည်ဖြစ်ကြောင်း၊ ဒေသတွင်း လူမှုစီးပွား တိုးတက်ဖွံ့ဖြိုး စေမည်ဖြစ်ကြောင်း နှင့် နိုင်ငံတော်အတွက် အခွန်ဘဏ္ဍာများ တိုးတက်ရရှိစေမည် ဖြစ်ကြောင်း တင်ပြအပ်ပါသည်။

EXECUTIVE SUMMARY

1. Project Background

Myanmar Carlsberg (Myanmar Carlsberg), one of the subsidiaries of Carlsberg Co., Ltd. was established in 2013 with local partner Myanmar Golden Star (MGS) Beverages Co., Ltd. and it was opened in 2014. The share ratio of Myanmar Carlsberg is 49% from MGS Co., Ltd. and 51% from Carlsberg Co., Ltd. of foreign investment established under the Foreign Investment Law and Myanmar Companies Act. The permitted duration of the project shall be 50 years from the date of the issuance of Myanmar Investment Commission's permit. Type of investment business is joint venture and the company distributes the products with four brands such as Carlsberg, Black Eagle, Tuborg and YOMA brewery to the market. The location map of the project is described in Figure 1.

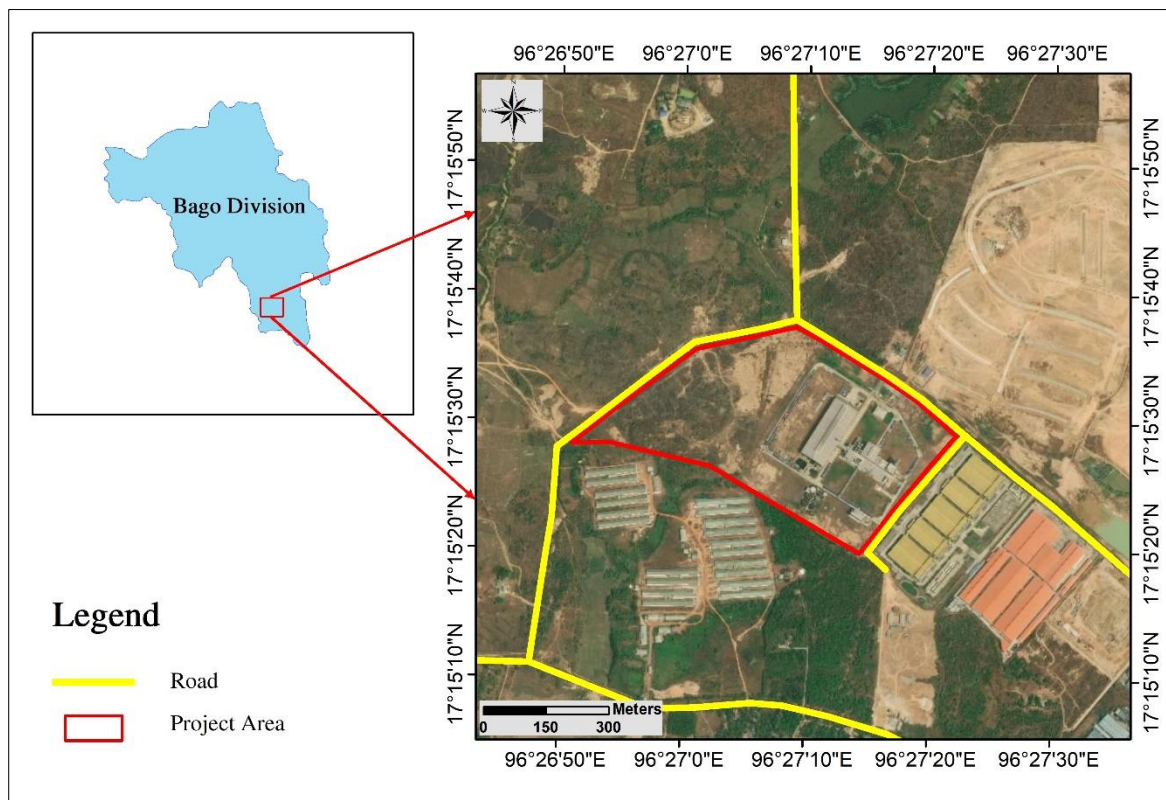


Figure 1 Location Map

The brewery factory facilities and structure are arranged to meet the international standard. The project is located at Block 3 to 13, Industrial zone (Foreign), Bago Township, Bago Region, Myanmar. The location of the project is 17° 15' 28.65" N and 96° 27' 13.51" E. The total area of land is 53.75 acres which is equivalent to 218,000 m². Currently, 75 workers are working at this factory. (See detail in CHAPTER 1).

2. Legal Requirements

Environmental management of the Project/Factory needs to comply with legal requirements of the Environmental Management Plan prescribed in the Environmental Conservation Rules, Notification No. 50/2014 and the EIA Procedure, Notification No. 616/2015.

An EMP is a project document to be prepared according to the requirements and guidance of the Ministry of Natural Resources and Environmental Conservation (MONREC). In order to refrain from, protect against, mitigate and monitor adverse impacts caused by the design, construction, implementation, operation, maintenance, termination, or closure of a project or business or activity; or after its closure, or by any other related cause [Environmental Conservation Rules, 50/ 2014, Chapter I, Article (s 2g)]. An EMP should be included programs to manage, implement activities, and monitor changes to the environmental context. The details of legal requirements are presented in **CHAPTER 2**. The relevant Myanmar laws and regulations are described in the following Table 1.

Table 1 Relevant Myanmar Laws and Regulations

No.	Laws and Regulation	Date of enactment
Environmental Conservation		
1.	Environmental Conservation Law	30 th March, 2012
2.	Environmental Conservation Rules	5 th June, 2014
3.	Environmental Impact Assessment Procedure	29 th December, 2015
4.	National Environmental Policy	2019
Pollution Control Guidelines		
5.	National Environmental Quality (Emission) Guidelines	29 th December, 2015
6.	Draft National Drinking Water Quality Standards	2014
Health and Safety Laws		
7.	Public Health Law	1972
8.	The Control of Smoking and Consumption of Tobacco Product	4 th May, 2006
9.	The Prevention and Control of Communicable Diseases Law	20 th March, 1995
10.	Occupational Safety and Health Law	15 th March, 2019
11.	Prevention of Hazard from Chemical and Related Substances Law	26 th August, 2013
12.	Myanmar Fire Brigade Law	17 th March, 2015
Biodiversity and Resources Conservation		
13.	Conservation of Biodiversity and Natural Protected Area Law	2018
14.	Protection of Wildlife and Conservation of Natural Areas Law	8 th June, 1994
15.	Forest Law	3 rd November, 1992
16.	The Law Relating to Aquaculture	7 th September, 1989
17.	Multi-different Kind of Biological Life and Environmental Protection Law	21 st May, 2018
Surface and Groundwater Laws		
18.	Conservation of Water Resources and River Law	2 nd October, 2006, amended in 2017
19.	Conservation of Water Resources and River Rules	27 th January, 2013
20.	Underground Water Act	21 st June, 1930
Land Acquisition and Resettlement		
21.	Land Acquisition, Resettlement and Rehabilitation Law	24 th August, 2019

22.	Constitution of the Republic of the Union of Myanmar	2008
23.	The Land Acquisition Act	1894
24.	Land Nationalization Act	1953
25.	Farmland Law	30 th March, 2019
26.	Farmland Rules	2012
27.	Vacant, Fallow and Virgin Land Management Law	2018
28.	Registration of Deeds Law	20 th March, 2019
29.	The Boundaries Law	25 th March, 2019
Urban Development and Management		
30.	Development Committee Law	2013
31.	Development Law of Bago Region	27 th December, 2016
32.	Myanmar Engineer Council Law	28 th November, 2013
33.	The Electricity Law	27 th October, 2014
Labor Laws		
34.	Labor Organization Law	11 th October, 2011
35.	The Employment and Skill Development Law	30 th August, 2013
36.	The Minimum Wage Law	22 nd March, 2013
37.	Payment of Wage Law	25 th January, 2016
38.	The Settlement of Labour Dispute Law	28 th March, 2012
39.	The Leave and Holiday Act	1951 (Amended in July, 2014)
40.	Social Security Law	31 st August, 2012
41.	The Rights of the Persons with Disabilities Law	9 th June, 2015
42.	Child Rights Law	23 rd July, 2019
Protection and Preservation Laws		
43.	The Protection and Preservation of Cultural Heritage Region Law	28 th February, 2019
44.	The Protection and Preservation of Ancient Monument Law	26 th August, 2015
45.	The Protection and Preservation of Antique Object Law	2015
Other Related Laws and Regulations		
46.	The Factories Act	1951, Amended in 20 th January 2016
47.	The Myanmar Excise Act	1 st October, 1917 (Amended on 22 nd December, 2015)
48.	Boiler Law	14 th July, 2015
49.	The Consumer Protection Law	14 th , March, 2014
50.	Natural Disaster Management Law	31 st July, 2013
51.	Law on Standardization	3 rd July, 2014
52.	The Export and Import Law	17 th September, 2012
53.	Myanmar Investment Law	18 th October, 2016

54.	Myanmar Investment Rules	30 th March, 2017
55.	Myanmar Insurance Law	23 rd July, 1993
56.	Private Industrial Enterprise Law	26 th November, 1990
57.	The Petroleum and Petroleum Product Law	1 st August, 2017
58.	The Motor Vehicle Law	7 th September, 2015
59.	Trademark Law	2019
60.	Myanmar Company Law	7 th September, 2015
61.	Commercial Tax Law	24 th Mar, 2014
62.	The Specific Goods Tax Law	18 th January, 2016

3. Production Process

The project is a factory that produces brewery by using advanced technology. The products of the factory can be seen in the following Figure 1.



Source: Myanmar Carlsberg Company Limited

Figure 1 Factory's Products

In the production of brewery, malt and rice, yeast, sugar, as well as other supportive materials are the main type of raw materials. Firstly, malt and rice are crushed separately to break up the grain kernels in order to produce a milled product called grist. The grist is then transferred into a mash tun, where it is mixed with heated water in a process called mash conversion. This process produces the sweet liquid known as wort. The mash is then passing through the filtration process, where wort is separated from the spent grains and spent hops. The wort collected from previous process is transferred to a brew kettle and boiled to sterilize and concentrate it. After boiling, the wort is transferred into a whirlpool for the wort separation. During this stage, any malt or hop particles are removed to leave a liquid that is ready to be cooled. To start the fermentation, yeast is added during the filling of the vessel after cooling stage. Yeast converts the sugary wort into brewery by producing alcohol. After fermentation, the young "green" brewery needs to be matured in order to allow both a full development of flavors and a smooth finish. Membrane filter is used as the secondary filtration in brewery production process before filling into the storage tank. The final stage of the brewery production process is the packaging. In which, brewery bottles, cans and keg are sterilized first before filling with brewery in the filling station. Finally, the products are ready for market distribution. The flow chart of brewery production process is shown in Figure 2.

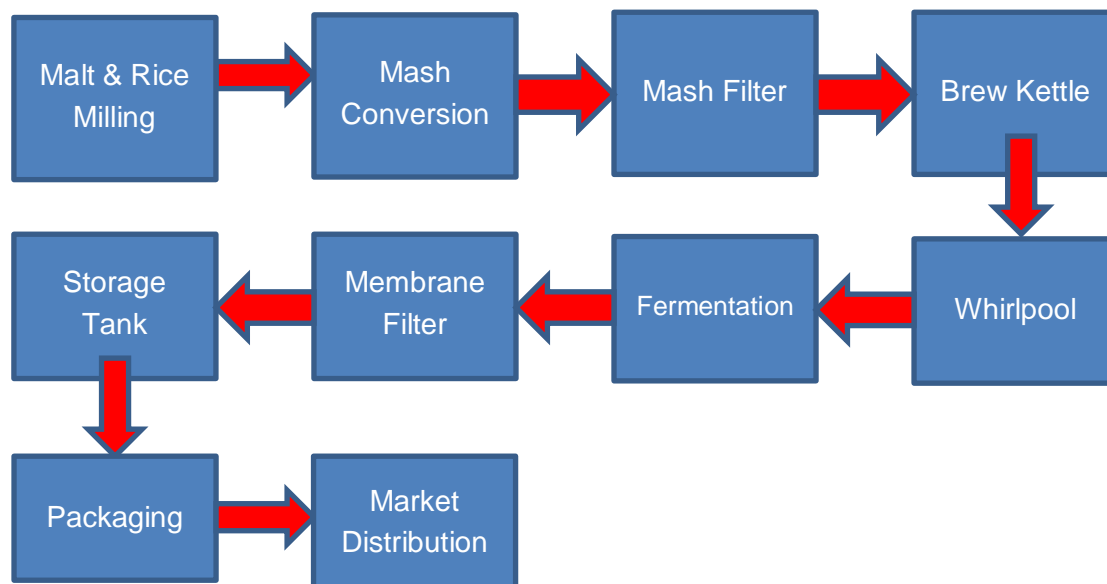


Figure 2 Production Process Flow Chart

4. Description of the Surrounding Environment

The purpose of this section is to predict how environmental and socio-economic conditions will be impacted due to the implementation of the project. This requires knowledge of the baseline conditions at the project site, which are established through desktop study research as secondary data collection from the existing sources, site surveys, primary data collection and projections for future developments. The project is located at Block 3 to 13, Industrial zone (Foreign), Bago Township, Bago Region, Myanmar. The location of the project is 17° 15' 28.65" N and 96° 27' 13.51" E. The total area of land is 53.78 acres which is equivalent to 218,000 m². In EMP report, about 500-meter radius around the project site was studied and the details of surrounding environments are presented in **CHAPTER 4**.

4.1 Topography

Bago Township has located in the southern part of the Central Myanmar Belt, that has situated in Bago-YOMA Basin, which is one of the eight tertiary basins in the onshore of Myanmar. It is composed mostly of flat alluvial plains.

4.2 Air Quality

Air quality measurement was conducted in the study area for 24-hour from 14th July, 2020 to 15th July, 2020. Concentration of air pollutants were measured at 17° 15' 23.28" N and 96° 27' 14.13" E by using the Haz-Scanner. To reveal the existing status of baseline air quality, the average air quality was compared with NEQEG guideline. All parameters' concentrations are within the standard limit. The mitigation measures to improve air quality are mentioned in the **CHAPTER 7**.

4.3 Water Quality

On 24th June 2020, water samples were collected at 4 points from the brewery outlet. As the brewery production process produces high concentrated wastewater, several parameters of untreated wastewater exceed the standard limit of NEQEG. The mitigation measures to improve water quality are mentioned in the **CHAPTER 7**.

4.4 Vibration

The vibration measurements were conducted at 6 points. The measurement method is a real-time measurement data display on the screen, which was recorded in the survey onsite paper. The mitigation measures to improve water quality are mentioned in the **CHAPTER 7**.

4.5 Noise

Noise measurements were conducted at two places: at the operation area during day time and in the factory compound during night time from 14th July, 2020 for 24 hours. The levels of noise results were within NEQEG guidelines.

4.6 Temperature

Temperature measurements are measured at 10 points. When the results are compared with IFC standard value, all results are within the standard.

4.7 Light

Light measurements were recorded at 9 points in the factory. The measurement results were compared with IFC guidelines and found that places except check and repair department and office were necessary to meet the IFC guidelines.

4.8 Land Use

The study area consists of the proposed project site about 53.78 acres and 1km marginal area. The study area is characterized by 7 types of land use: (1) Industrial area, (2) Bareland, (3) Paddy Field, (4) Residential area, (5) Road, (6) Water body, (7) Religious area. Industrial area is largest portion within 1km marginal area where Religious area occupies smallest portion. The land use type and area are summarized and illustrated in Table 4-48 and Table 4-49. (See details in **CHAPTER 4**).

5 Potential Environmental Impact Assessment

Not only the construction and decommission but also operation of the factory can impact to the environment. The most common type of impacts on the environment are included (a) air emission (b) noise and vibration (c) wastewater from staff and operation processes, (d) solid waste and (e) occupational health and safety of employees. Potential environmental impacts and mitigation measures are presented in **CHAPTER 5**.

6 Public Consultation and Public Participation

Public consultation is necessary as a part of the EMP study. The project proponent and its consultant have to organize a public consultation among regulators, local community, local authority and other relevant organizations on the project development and plans.

Currently, due to the spread of Coronavirus disease 2019 (COVID-19), the government banned public events and mass gatherings. Therefore, public consultation meeting has not been conducted yet. However, if the government allows these events again, public consultation will be conducted and comments and suggestions from this meeting will be added to this EMP report again.

7 Environmental Management Plan

The objective of the environmental management is to ensure potential environmental issues managed by proper mitigation measures in compliance with the relevant laws and regulations stipulated by national authorities. Environmental management based on the basic principles of management is known as the P.D.C.A cycle (see Figure 3). Environmental management consists of four related tasks as described below:

➤ **Plan (P) - What need to be done**

Mitigation measures for the potential environmental impacts of the factory such as air emission, noise, solid waste, wastewater and health and safety at work is described in this chapter. The project proponent will follow the plan for the mitigation measures according to the scheduled time.

➤ **Do (D) - Implement the plan**

The Project proponent as described in this chapter will implement the mitigation measures for the potential environmental impacts appropriately.

➤ **Check (C) - Monitor and evaluate the results of implementation**

The effectiveness of the mitigation measures will be monitored, evaluated and documented.

➤ **Act (A) - Taking corrective actions to improve the results, if found inadequate**

If nonconformities are noted with reference to the environmental monitoring benchmarks, corrective actions are needed to plan to mitigate the existing environmental impacts.

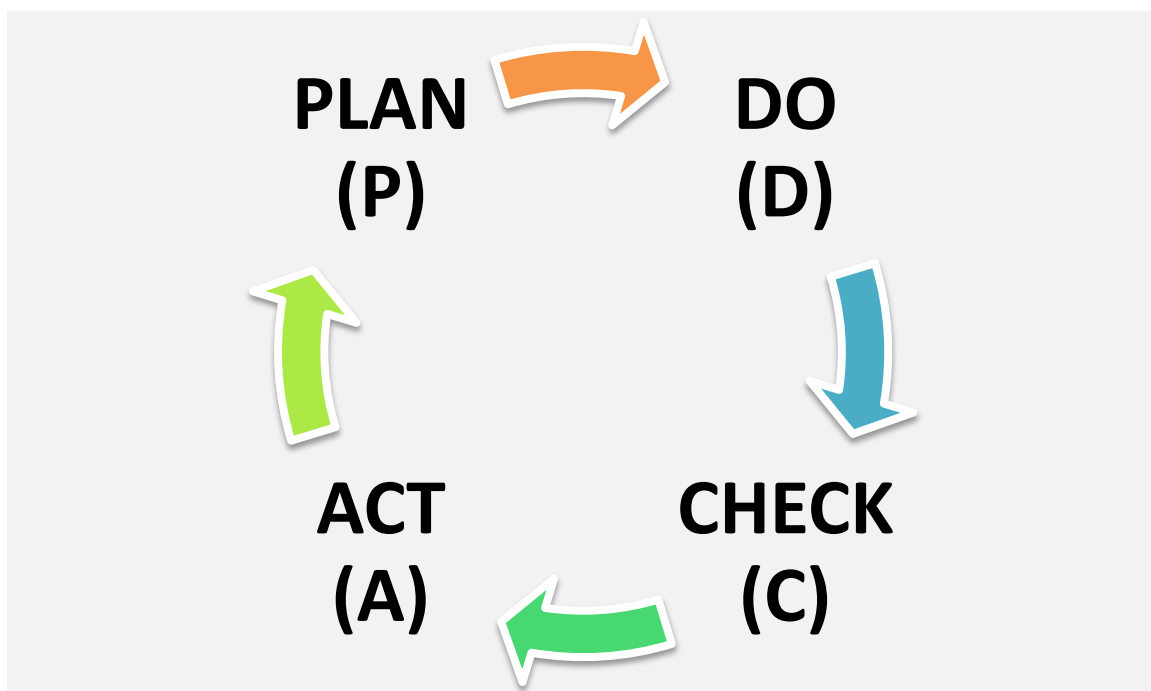


Figure 3 P. D. C. A Cycle

7.1 Environmental and Social Impacts

(I) Construction Phase

a) Air Quality

Construction During construction and decommission phase, emission of fugitive dust resulting from the concrete mixing, digging concrete floor, construction vehicle circulation and site preparation for the construction activities such as blasting of rocks, earth moving, and exposure of bare soil to wind. In addition, secondary air pollution source was occurred by exhaust from diesel generator, earth moving equipment, and on-site open burning of solid waste. The construction activities for renovation process could be considered as a small-scale civil work.

b) Noise and Vibration

During construction and decommission phase, the operation of heavy equipment and earthmoving machinery can cause noise and vibration disturbance to surrounding community such as site clearing, pile driver operation, excavation equipment, cranes, operation of concrete mixer, equipment transportation, emergency generator and related building construction works. These nuisance noises and vibration will be limited and mostly site-specific is not much effected to the environment or local communities as the project is located in the industrial zone.

c) Water Quality

During construction and decommission phase, water required for all construction and decommission activities and domestic will be used from the groundwater (tube wells). Anyhow, the construction time is limited, and construction activities are not much extensive. Therefore, not too much wastewater is generated from construction and decommission activities. Only domestic wastewater was produced depending on the number of construction workers during day shift. The domestic wastewater generated from the construction site was from toilet and wash water. Therefore, this is insignificant volume of water discharge and could be negligible of environmental impact.

d) Waste management

- **Non-Hazardous Waste**

Residual wastes were generated during the factory construction and decommission phase. Source of solid waste will be from the removal of top soil and old structures, faulty construction activities and other construction and decommission wastes such as small concrete spills, scrap wood and metals. Other non-hazardous wastes consist of domestic waste discharged from workers such as plastic, garbage, glass and food waste.

- **Hazardous Waste**

Hazardous wastes from the construction and decommission stages such as treated timber, concrete additives, asbestos, contaminated soils, preservative, adhesives, paint, fluorescent light tubes, and lead-acid batteries can cause potential negative environmental impacts due to improper management of solid waste.

e) Land

The site clearing including removal of vegetation and top soil was carried out around the project site to implement the installation of infrastructure. However, these land use changes due to the project factory can be assumed as moderate impact to the surrounding environment.

f) Soil Quality

Construction and decommission activities for the project factory can create soil contamination such as leakage of fuel and oil and other various wastes on the ground.

g) Cultural Heritage

The factory is established in Bago Industrial Zone in which the cultural heritage such as archaeological sites and traditional building and monuments are not existed. Therefore, the activities that can cause potential negative impacts on cultural heritage will not be happened during construction and decommission stages.

h) Ecosystem

There may be no significant impacts on surrounding ecosystem since the project is located in the industrialized area and there is no protected areas, reserved forests and wetlands, threatened species and national parks near the factory area. Although civil works from the construction and decommission of factory may generate impacts on fauna and flora, the scale of impact is expected to be negligible.

i) Health and Safety

The potential impacts on health and safety during construction and decommission phase are listed below.

- Slips and falls due to the unskilful workers
- Working at height of building during roofing and painting.
- Increased temperature of equipment surface.
- Dusty in the ambient air of the working zone.
- Moving machinery can cause temporary hazards such as vehicle traffic and accident in moving and lifting equipment.
- Risk from handling or being exposed to hazardous materials that will be used at the construction site.

j) Socio- economic

There will be positive impacts on local people due to job opportunities and the materials and equipment may be purchased from local shops during construction and decommission stages of the factory. Therefore, potential positive impacts on their livelihood are expected.

(II) Operation Phase

a) Air Quality

During the operation phase, activities such as fugitive dust from loading and unloading of raw materials and cleaning floor can cause air pollution. In addition, emergency use of generators, raw materials transportation, energy consumption for brewery production, and products distribution may emit particulate matters such as CO₂, NO₂, CO, CH₄, O₃, PM₁₀, PM_{2.5}, SO₂, VOCs. However, it can be concluded, as the impact is not significant because the generator and vehicle movements will run only a short time and the energy consumption for this factory use hydropower electricity. Therefore, any harmful gaseous air pollutants will not be produced. Although air quality of this factory can be poor, the impact can be insignificant since the project is located in the industrial zone.

b) Noise and Vibration

During the operation phase, manufacturing processes such as milling process may cause noise and vibration on the surrounding environment. However, the magnitude will be at a limited scale.

c) Water Quality

During the operation phase, discharge of untreated wastewater from brewery production processes (e.g. rinsing process) and effluent discharge to the nearby waterbodies can cause water pollution. However, the impact will be moderate since the factory treated wastewater properly with wastewater treatment plant.

d) Waste management

- **Solid Waste from Factory**

Improper solid wastes discharge such as disposal of spent grain, hops, trub and yeast, diatomaceous earth slurry, and packaging materials can cause negative impact on the environment. However, the impact will be low since by products such as spent grain, hops and trub are sold as the livestock feed, renewable energy or soil improver and uncontrolled land filling will be avoided in any form. In addition, the packaging wastes such as used can, waste carton, wooden pallet, paper layer pad and plastic frame will be handled by reuse, recycle method or treated separately. Since the industrial wastes are properly managed by project proponent, the negative impact on the environment is less likely to occur.

- **Solid Waste from Workers**

During operation phase, solid waste is generated from the workers are plastic, paper, glass and food waste. The solid wastes from workers in the project site will less likely to cause the adverse effects to environment.

e) Soil Quality

During the operation phase, the transportation of raw materials, glass bottles and cans can cause soil contamination such as leakage of fuel and oil and other various wastes on the ground. However, the magnitude of impact will be insignificant.

f) Offensive Odour

During the operation phase, although manufacturing processes such as fermentation process can cause offensive odour, the extent of the processes will be within the specific site. Therefore, the impact can be negligible.

g) Ecosystem

Improper discharge of untreated wastewater and solid waste from the production processes can cause certain adverse impact on nearby aquatic ecosystem and habitats of flora and fauna. However, the possibility is unlikely since the factory manage wastewater and solid wastes properly.

h) Health and Safety

Factory will use light tubes for general lighting purposes. This includes space lighting and task lighting. Activities of the workers in the operating sector depend on the quality of light; thus, it is important to provide sufficient lighting to those areas.

Physical injuries may occur in workplaces such as fall on slippery floors, accidents from the improper use of machines and tools, electricity shock and improper product loading and unloading in store.

i) Socio- economic

The socio-economic impacts are considered as positive because more jobs opportunities are created during operation phases of the project. The factory workers comprising both skilled and unskilled will be recruited from the local community. The project proponent will implement the following practices during operation phase:

- Promote the fair treatment, non-discrimination and equal opportunity for workers;
- The Project proponent plans to increase the production capacity in this years, nearby communities will get benefit by being the source of work force for the factory;
- Ensure total compliance with national labor and employment laws;
- To avoid exploitation of child labor by contractor, sub-contractor and supply chain;
- Promote safe and healthy working conditions;
- Project proponent should try to mitigate or minimize negative impacts while enhancing and maximizing the positive impacts to their optimum.

7.2 Monitoring Program

Environmental monitoring plan is important for the effective execution and successful implementation of EMP. Environmental monitoring focuses on the work environment which includes, waste management, health and safety of workers, safety of the facilities and socio-economic component of the environment. The objectives of monitoring program are;

- To measure impacts that occurs during the operation phase of the project
- To ensure compliance with statutory requirements

- To determine the effectiveness of mitigation measures and other measures
- To assist in the implementation of EMP

In monitoring program, parameters which are necessary to monitor, monitoring places, period and responsible organization is shown in Table 2. Environmental management plan and monitoring plan are also provided. **(See detail in CHAPTER 7)**

Table 2 Monitoring Plan

Monitoring item	Monitoring Parameter	Target level	Area to be Monitored	Frequency	Estimated Budget (MMK)	Responsible Team
Air quality	CO ₂ , CO, CH ₄ , NO ₂ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂ , VOCs	Within ambient standards level of NEQG and International Standards	Generators, Operation area	Twice a year during operation phase	2,000,000	Environmental Quality Monitoring Team
Noise	Noise level (dB(A) scale)	Within standards of International limit/ NEQG	Operating Area	Twice a year during operation period	1,000,000	Environmental Quality Monitoring Team
Vibration	Radial, Transverse, Vertical	Within standards of International limit/ NEQG	Operating Area	Twice a year during operation period	1,000,000	Environmental Quality Monitoring Team
Solid waste	Production waste, rejected products, packaging waste bags and containers Domestic refuse, paper and general office waste and domestic waste	Volume of solid waste (ton or kg)	Temporary Storage Sites of proposed factory	Annually	2,000,000	Environmental Quality Monitoring Team
Wastewater	BOD ₅ , Antibiotics, COD, Oil and grease, pH, Temperature increase, Total coliform bacteria, Total nitrogen, Total phosphorus, TSS	Within ambient standards level of NEQG of Breweries and Distilleries		Annually	1,000,000	Environmental Quality Monitoring Team
Occupational Health and Safety	Incident/accident records	Zero accident cases, safety training for workers and accident reports, community consultation	At the factory and production sector	Annually	5,000,000	Occupational Safety Team

7.3 Fund for EMP

The budget for EMP fund will cover the initial cost and recurring expenses for implementation EMP. Annual budget allocation for proposed environmental, health and safety mitigation measures are shown in Table 3.

Table 3 Estimated Budget for Environmental, Health and Safety Mitigation Measurement

No	Proposed Environmental Mitigation Measures	Estimated Budget (MMK)
Environmental Work		
1	Monitoring program	7,000,000
2	Emergency case	500,000
3	Capacity building and training	500,000
Health and Safety Work		
4	Personal protective equipment	3,000,000
5	Medical support for clinic	500,000
6	Firefighting equipment	500,000

8 Conclusion

The following recommendations have been made for efficient and effective implementation of environmental conservation, health and safety and social responsibilities through the lifespan of the proposed project. Therefore, the project proponent will fully follow the commitments, mitigation measures according to this EMP. Moreover, due to this project, more livelihoods of the local community will be developed.

- Follow the comments and suggestions made by ECD after reviewing this EMP report.
- For full and proper implementation of EMP, well understanding and supports by proponent and authority is deem necessity.
- Well experienced and knowledgeable HSE manager and HSE assistants shall be appointed.
- Daily, monthly and annual action plan shall be formulated based on this EMP and practiced at operation level.
- Keep full records of environmental management activities and submit to annual independent third-party environmental audit.
- Follow the audit report and comments.
- Abide environmental policy, laws, rules and instructions of the Republic of the Union of Myanmar.

Therefore, the project proponent will fully abide by rules which are included in EMP report, will try to develop local socio-economic sector and can increase tax rate of the country.

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CHAPTER 1 INTRODUCTION

Myanmar Carlsberg (Myanmar Carlsberg), one of the subsidiaries of Carlsberg Co., Ltd. was established in 2013 with local partner Myanmar Golden Star (MGS) Beverages Co., Ltd. and it was opened in 2014. The share ratio of Myanmar Carlsberg is 49% from MGS Co., Ltd. and 51% from Carlsberg Co., Ltd. of foreign investment established under the Foreign Investment Law and Myanmar Companies Act. The permitted duration of the project shall be 50 years from the date of the issuance of Myanmar Investment Commission's permit. Type of investment business is joint venture and the company distributes the products with four brands such as Carlsberg, Black Eagle, Tuborg and YOMA brewery to the market. The project proponent requested Total Business Solution Co., Ltd. (TBS) (Consulting firm) to complete the Environmental Management Plan (EMP) for the proposed project.

The project is a factory that produces brewery by using advanced technology. Although the majority of raw materials are derived from local products, some are imported from overseas. EMP for the project identifies the principal approaches, procedures and methods to control and minimize the environmental and social impacts of the factory operation. The main objectives of the EMP are (a) to identify environmental impacts, (b) to define details of who, what, where and when environmental management and mitigation measures to be implemented and (c) to ensure that the environmental quality of the area does not deteriorate due to the project. Salient features of project are described in Table 1-1 and front view of the factory is shown in Figure 1-1.

Table 1-1 Salient Features of Project

Name of the Investor	Christoph Vavrik
Citizenship	Austria
Type of Investment Business	Manufacture of Beverage
Amount of Foreign Capital	37 Million
Construction Period	2 Years, 2013-2015
Validity of Investment Permit	50 Years
Form of Investment	Private Company Limited by Shares



Figure 1-1 Front View of the Factory

1.1. PROJECT PROPONENT PROFILE

The factory is located at Block 3 to 13, Foreign Industrial Zone Area, Bago Township, Bago Region, Myanmar. Representative's name, contact of the project proponent and list of executives are shown in Table 1-2 and Table 1-3. Organization chart is shown in Figure 1-2.

Table 1-2 Contact Detail of Representative

Representative	Than Zaw
Position	Senior Brewery Manager
Phone	09-969606508
Address	No.128/8, Sayar San Street, Oakthar Myo Thit, Bago

Table 1-3 List of Executives of Myanmar Carlsberg

Sr. No.	Name	Citizenship & Passport No.	Address	Proposed Designation	Shares-holding
1.	Christoph Vavrik (Paduak Holding PTE LTD)	Austria U0207224	Level 13 & 14, Kantharyar Center- Office Tower, Yangon, Myanmar	Director	51
2.	Thant Zin Tun (MGS Breweries Company Limited)	Myanmar 12/BAHAN(NAING) 078105	No.52/B, Shwe Taung Kyar, Bahan Township, Yangon	Director	49
Total Capital				100%	

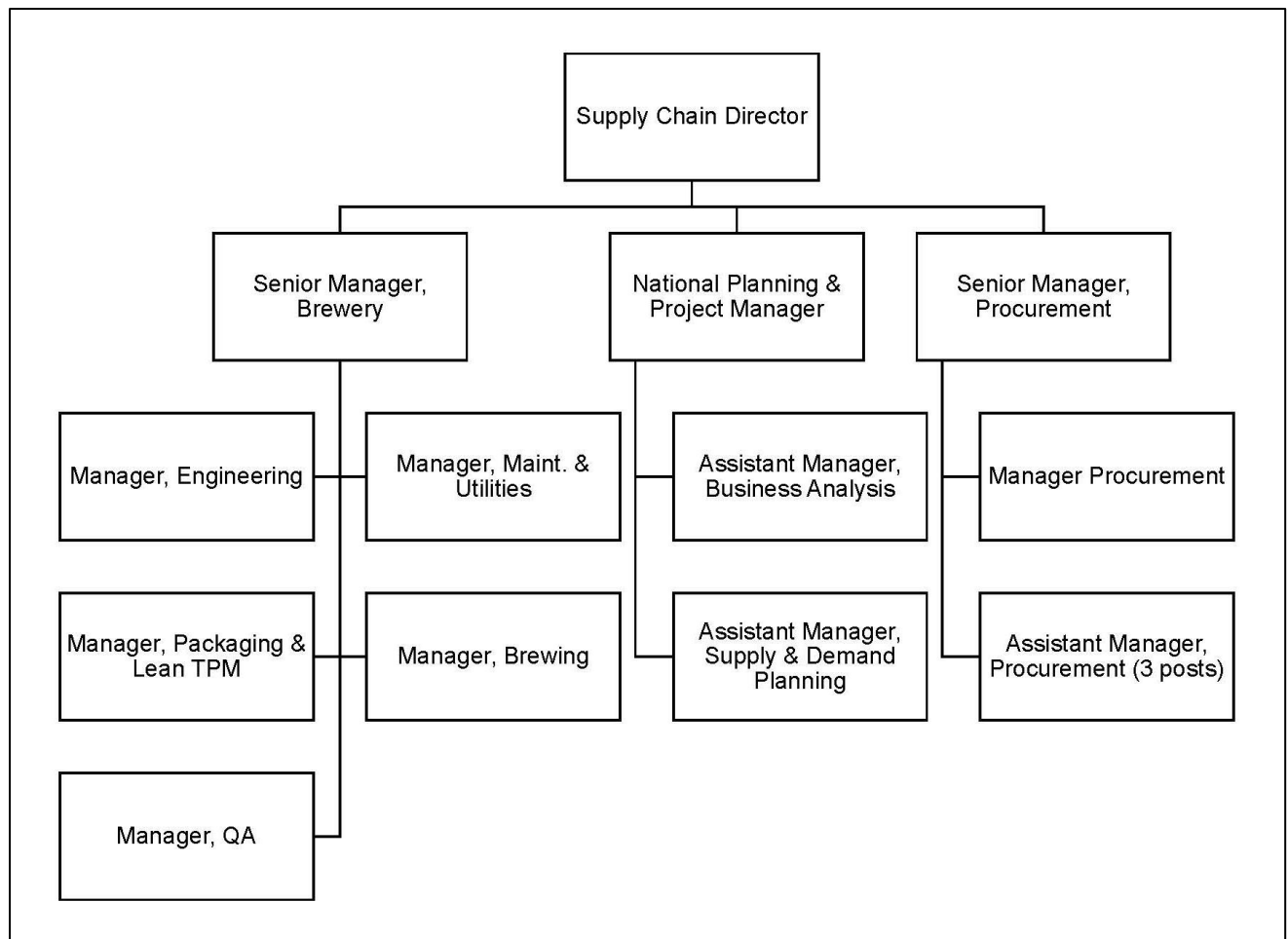


Figure 1-2 Organization Chart

1.2. AIMS OF THE PROJECT

The objectives of Myanmar Carlsberg are as follows;

- To promote high-quality range of alcohol-free breweris for consumers
- To reach over 20 million people in 20 markets on the day together with partners such as restaurants, bars, authorities and NGOs.
- As part of its new sustainability programme, Together Towards ZERO, Myanmar Carlsberg has set a bold vision for a society without irresponsible drinking along with ambitions of ZERO carbon emissions, ZERO water waste and ZERO accidents.
- It aims to see a continuous reduction in irresponsible drinking across all of its markets in support of the World Health Organisation's (WHO) objective to reduce harmful drinking, and Sustainable Development Goal (3) to ensure healthy lives and promote well-being for all ages.

1.3. THE ENVIRONMENTAL CONSULTING ORGANIZATION

TBS is a third-party organization, which conducted the EMP of this project. The contact name and address of the Environmental Consulting Organization is described below:

Representative: Dr. Soe Moe Kyaw Win, Ph.D., P.Eng. P.Geo.
Position: Managing Director
Mobil Phone: +95 9455309359
Office Phone: +95 9401604493
Email: drsoemoe@outlook.com
Address: No.54, Room no. 704, Waizayantar Tower, Waizayantar Road, Thingangyun Township, Yangon, Myanmar

1.4. BACKGROUND INFORMATION OF TBS

TBS registered with Myanmar Investment Commission (MIC) since 2012. Its office is located in No. 54, Room No. 704, Waizayantar Tower, Waizayantar Road, Thingangyun Township, Yangon, Myanmar. Since its inception, TBS, in collaboration with TEAM Group of Companies at Thailand, has been providing consulting services to the private and public sectors in Myanmar. The two partners with their combined strengths provide services to assist investors in project development or setting up and operating businesses in Myanmar. Their services have gained recognition from Myanmar and foreign investors involved in development projects including port, industrial estate, power transmission, flood control, drainage and sewerage system, environmental impact assessment, initial environmental examination and environmental management plan.

Completed environmental projects, experiences of environmental consultants and the roles of applicant members in projects by TBS are shown in **APPENDIX A**.

1.5. THE ENVIRONMENTAL CONSULTING CERTIFICATE

The Certificate for Transitional Consultant Registration of the Ministry of Natural Resources and Environmental Conservation is shown in **APPENDIX B**.

CHAPTER 2

LEGAL REQUIREMENT

2.1. INTRODUCTION

Myanmar Carlsberg has environmental policy of doing environmentally and socially responsible with minimal impact on the environment. It must follow all laws and regulations prescribed by the Republic of the Union of Myanmar over specified in environmental policy, laws, rules, regulations and other international guidelines.

The company is working with the local committees and government agencies, such as the Ministry of Natural Resources and Environmental Conservation Department (MONREC) integrating the environment into its planning, operations and policy decisions. The first and foremost policy is to comply with laws, rules and regulations relating to the physical and social environment. Most of all, it will follow the rules and regulations set up by the Environmental Conservation Department (ECD), the main agency responsible for environmental management of regional level. The company pledges to do the business that will be environmentally as practical as possible.

Environmental management of the Project/Factory needs to comply with legal requirements of the Environmental Management Plan prescribed in the Environmental Conservation Rules, Notification No. 50/2014 and the EIA Procedure, Notification No. 616/2015.

An EMP is a project document to be prepared according to the requirements and guidances of MONREC. In order to refrain from, protect against, mitigate and monitor adverse impacts caused by the design, construction, implementation, operation, maintenance, termination, or closure of a project or business or activity; or after its closure, or by any other related cause [Environmental Conservation Rules, 50/ 2014, Chapter I, Article (s 2g)]. An EMP should include programs to manage, implement activities, and monitor changes to the environmental context. In addition, Myanmar Carlsberg's certificate from Myanmar Investment Commission (MIC) is shown in **APPENDIX C**.

2.2. RELEVANT MYANMAR LAWS AND REGULATIONS

The existing Myanmar laws and regulations relevant to environmental, health and safety issues for this project are listed below.

Table 2-1 Relevant Myanmar Laws and Regulations

No.	Laws and Regulation	Date of enactment
Environmental Conservation		
1.	Environmental Conservation Law	30 th March, 2012
2.	Environmental Conservation Rules	5 th June, 2014
3.	Environmental Impact Assessment Procedure	29 th December, 2015
4.	National Environmental Policy	2019
Pollution Control Guidelines		
5.	National Environmental Quality (Emission) Guidelines	29 th December, 2015
6.	Draft National Drinking Water Quality Standards	2014

Health and Safety Laws		
7.	Public Health Law	1972
8.	The Control of Smoking and Consumption of Tobacco Product	4 th May, 2006
9.	The Prevention and Control of Communicable Diseases Law	20 th March, 1995
10.	Occupational Safety and Health Law	15 th March, 2019
11.	Prevention of Hazard from Chemical and Related Substances Law	26 th August, 2013
12.	Myanmar Fire Brigade Law	17 th March, 2015
Biodiversity and Resources Conservation		
13.	Conservation of Biodiversity and Natural Protected Area Law	2018
14.	Protection of Wildlife and Conservation of Natural Areas Law	8 th June, 1994
15.	Forest Law	3 rd November, 1992
16.	The Law Relating to Aquaculture	7 th September, 1989
17.	Multi-different Kind of Biological Life and Environmental Protection Law	21 st May, 2018
Surface and Groundwater Laws		
18.	Conservation of Water Resources and River Law	2 nd October, 2006, amended in 2017
19.	Conservation of Water Resources and River Rules	27 th January, 2013
20.	Underground Water Act	21 st June, 1930
Land Acquisition and Resettlement		
21.	Land Acquisition, Resettlement and Rehabilitation Law	24 th August, 2019
22.	Constitution of the Republic of the Union of Myanmar	2008
23.	The Land Acquisition Act	1894
24.	Land Nationalization Act	1953
25.	Farmland Law	30 th March, 2019
26.	Farmland Rules	2012
27.	Vacant, Fallow and Virgin Land Management Law	2018
28.	Registration of Deeds Law	20 th March, 2019
29.	The Boundaries Law	25 th March, 2019
Urban Development and Management		
30.	Development Committee Law	2013
31.	Development Law of Bago Region	27 th December, 2016
32.	Myanmar Engineer Council Law	28 th November, 2013
33.	The Electricity Law	27 th October, 2014
Labour Laws		
34.	The Labour Organization Law	11 th October, 2011
35.	The Employment and Skill Development Law	30 th August, 2013
36.	The Minimum Wage Law	22 nd March, 2013
37.	Payment of Wage Law	25 th January, 2016

38.	The Settlement of Labour Dispute Law	28 th March, 2012
39.	The Leave and Holiday Act	1951 (Amended in July, 2014)
40.	Social Security Law	31 st August, 2012
41.	The Rights of the Persons with Disabilities Law	9 th June, 2015
42.	Child Rights Law	23 rd July, 2019
Protection and Preservation Laws		
43.	The Protection and Preservation of Cultural Heritage Region Law	28 th February, 2019
44.	The Protection and Preservation of Ancient Monument Law	26 th August, 2015
45.	The Protection and Preservation of Antique Object Law	2015
Other Related Laws and Regulations		
46.	The Factories Act	1951, Amended in 20 th January 2016
47.	The Myanmar Excise Act	1 st October, 1917 (Amended on 22 nd December, 2015)
48.	Boiler Law	14 th July, 2015
49.	The Consumer Protection Law	14 th , March, 2014
50.	Natural Disaster Management Law	31 st July, 2013
51.	Law on Standardization	3 rd July, 2014
52.	The Export and Import Law	17 th September, 2012
53.	Myanmar Investment Law	18 th October, 2016
54.	Myanmar Investment Rules	30 th March, 2017
55.	Myanmar Insurance Law	23 rd July, 1993
56.	Private Industrial Enterprise Law	26 th November, 1990
57.	The Petroleum and Petroleum Product Law	1 st August, 2017
58.	The Motor Vehicle Law	7 th September, 2015
59.	Trademark Law	2019
60.	The Myanmar Companies Law	6 th December, 2017
61.	Commercial Tax Law	24 th Mar, 2014
62.	The Specific Goods Tax Law	18 th January, 2016

2.3. ENVIRONMENTAL CONSERVATION

2.3.1. Environmental Conservation Law (30th March, 2012)

Environmental Conservation Law was enacted by the Pyidaungsu Hluttaw in 30th March, 2012.

Section 7 (o) states that “managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit

from the businesses which explore, trade and use the natural resources in environmental conservation works.

Section 14 states that “A person causing a point source of pollution shall treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.”

Section 15 describes that the owner or occupier of any business, material or place which causes a point source of pollution shall install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it shall be arranged to dispose the wastes in accord with environmentally sound methods.

According to Section 24, The Ministry may, in issuing the prior permission, stipulate terms and conditions relating to environmental conservation. It may conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organizations to carry out inspections.

Section 29 stipulates that “No one shall violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law”.

2.3.2. Environmental Conservation Rules (5th June, 2014)

This environmental conservation rule was approved by Ministry of Environmental Conservation and Forestry on 5th June in 2014.

Under Section 69, sub-Section (a) states that any person shall not emit, ask to emit, dispose, ask to dispose, pile and ask to pile, by any means, hazardous waste or hazardous substances stipulated by notification according to any rules in this rule at any place which may affect the public directly or indirectly. Sub-Section (b) states that nobody shall carry out any activity which can damage the ecosystem and the natural environment which is affected due to such system, except for the permission of the Ministry for the interests of the people.

2.3.3. Environmental Impact Assessment Procedure (29th December, 2015)

This procedure was enacted by Ministry of Environmental Conservation and Forestry on 29 December in 2015. This procedure assigns in responsibility to Project proponent for all adverse impacts in Section 102 to 105;

Section 102 states that the Project proponent shall bear full legal and financial responsibility for: (a) all of the Project proponent's actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the Project acting for or on behalf of the Project, in carrying out work on the Project; and (b) Project Affected Persons (PAPs) until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and shall support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.

Section 103 states that the Project proponent shall fully implement the Environmental Management Plan (EMP), all Project commitments, and conditions, and is

liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.

Section 104 states that the Project proponent shall be responsible for, and shall fully and effectively implement, all requirements set forth in the Environmental Compliance Certificate (ECC), applicable Laws, the Rules, this Procedure and standards.

Section 105 states that the Project proponent shall timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.

Monitoring process is described from Section 106 to 110. Section 106 states that the Project proponent shall, during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure), engage in continuous, proactive and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, the Rules, this Procedure, standards, the ECC, and the EMP.

Section 107 states that the Project proponent shall notify and identify in writing to the Ministry any breaches of its obligations or other performance failures or violations of the ECC and the EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project proponent becoming aware of such incident.

Section 108 states that the Project proponent shall submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.

Section 109 states that the monitoring reports shall include:

- (a) Documentation of compliance with all conditions;
- (b) Progress made to date on implementation of the EMP against the submitted implementation schedule;
- (c) Difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;
- (d) Number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;
- (e) Accidents or incidents relating to the occupational and community health and safety, and the environment; and
- (f) Monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.

Section 110 states that within ten (10) days of completing a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, the Project proponent shall make such report (except as may relate to National Security concerns) publicly available on the Project's website, at public meeting places (e.g. libraries, community halls) and at the Project offices. Any organization or person may

request a digital copy of a monitoring report and the Project shall, within ten (10) days of receiving such request, submit a digital copy via email or as may otherwise be agreed upon with the requestor.

Section 113 states that for purposes of monitoring and inspection, the Project proponent: (a) shall grant to the Ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; and (b) from time to time as and when the Ministry may reasonably require, shall grant the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.

Section 115 states that in the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements, the Project shall grant full and immediate access to the Ministry at any time as may be required by the Ministry.

The Project proponent shall further ensure that the Ministry's rights of access hereunder shall extend to access by the Ministry to the Project's contractors and subcontractors.

2.3.4. National Environmental Policy (2019)

National Environmental Policy of Myanmar was enacted by the Republic of the Union of Myanmar in 2019. In this policy, Section 8 states that the Government of the Republic of the Union of Myanmar is committed to putting this National Environmental Policy into action through a Strategic Framework and a series of master plans. The Strategic Framework applies the National Environmental Policy principles to priority thematic areas and sectors. It also provides environmental governance requirements for effective implementation, including institutional strengthening, monitoring and enforcement, public participation, dispute resolution and financing. The Strategic Framework provides guidance for preparing master plans for States and Regions and for the priority thematic areas and sectors. The master plans will contain specific activities, timeframes, budgets and performance targets for achieving the Strategic Framework objectives and, ultimately, the National Environmental Policy vision. The linkages between the National Environmental Policy, Strategic Framework and Master Plans are depicted in Figure 2-1.



(Source: EIA Procedure (2015))

Figure 2-1 National Environmental Policy Myanmar

2.4. POLLUTION CONTROL GUIDELINES

2.4.1. National Environmental Quality (Emission) Guidelines (No. 615/2015) (29th December, 2015)

The aim of national Environmental Quality (Emission) Guidelines provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.

2.4.1.1. Wastewater Effluent Levels Guideline for Breweries and Distilleries

This project associate with wastewater effluent levels guideline to prevent pollution from the production of brewery, wine and spirits from raw material storage to dispatch of the finished product. Therefore, wastewater from the processing process will be discharged in complied with the Article 2.3.1.8, guideline for effluent levels of breweries and distilleries from the National Environmental Quality (Emission) Guidelines.

Table 2-2 Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U. ¹	6-9
Temperature increase	°C	<3 ²
Total coliform bacteria	100 mL	400
Total nitrogen	mg/L	10
Total Phosphorus	mg/L	2
Total Suspended solids	mg/L	50

Source: National Environmental Quality Emission Guideline

2.4.2. Draft National Drinking Water Quality Standards (2014)

Even though the law is not yet approved, the draft 2014 National Drinking Water Quality Standards (NDWQS) is serving as the *de facto* standards for drinking water quality in Myanmar as ECD requires comparing the tested water quality results against the standard values. For this project, it is considered necessary to be applied when measuring underground water. The values required under 2014 draft (NDWQS) are shown below. In addition to the 16 items presented below, E. coli and Cadmium are normally required by ECD to be measured for underground water.

Table 2-3 National Drinking Water Quality Standards

Parameters	Unit	Standard Values
Total Coliforms	Most Probable Number (MPN)/100mL	0
Faecal Coliforms	MPN/100mL	0
Taste	acceptable/no objectionable taste	
Odor	acceptable/no objectionable odor	
Color	True Color Unit (TCU)	15
Turbidity	Nephelometric Turbidity Unit (NTU)	5
Arsenic	mg/L	0.05
Lead	mg/L	0.01
Nitrate	mg/L	50
Manganese	mg/L	0.4

¹ Standard unit

² At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge

Parameters	Unit	Standard Values
Chloride	mg/L	250
Hardness	mg/L as CaCO ₃	500
Iron	mg/L	1
pH	-	6.5 to 8.5
Sulphate	mg/L	250
Total Dissolved Solids (TDS)	mg/L	1,000

Source: NDWQS (2014/draft)

2.5. HEALTH AND SAFETY LAWS

2.5.1. Public Health Law (1972)

This law was enacted by the Myanmar State and Revolution Council with the notification number 1/1972. Chapter 2 of the law describes about the protection of public health. There are six Sections under Chapter 2. Those Sections describe that the government was working to improve the public health, to protect the public health and the following devices to perform for advices, inspection, supervision, repair, prohibition.

- Environmental Health Services
- About the sell and produced food of the people
- About the usage of household and cosmetic products
- About the infectious diseases
- About the private hospital
- About the usage of medicine for the people

2.5.2. The Control of Smoking and Consumption of Tobacco Product (4th May, 2006)

This law was enacted by the State Peace and Development Council Law with the notification No. 5/2006 on 4th May, 2006. Section 9 states that," The person-in-charge shall:

- Keep the caption and mark referring that it is a non-smoking area at the place mentioned in Section 6 in accordance with the stipulations;
- Arrange the specific place where smoking is allowed as mentioned in Section 7 and keep the caption and mark also referring that it is a specific place where smoking is allowed, in accordance with the stipulations;
- Supervise and carry out measures so that no one shall smoke at the non-smoking area; and;
- Accept inspection when the supervisory body comes to the place for which he is responsible

2.5.3. The Prevention and Control of Communicable Diseases Law (20th March, 1995)

This law was enacted by the State Law and Order Restoration Council with the notification no. 1/95 on 20th March, 1995. The main purpose of this law is to prevent the outbreak of Communicable Diseases. The Department of Health shall implement the following project activities in Section 3(a):

- i. Immunization of children by injection or orally;
- ii. Immunization of those who have attained majority, by injection or orally, when necessary;
- iii. Carrying out health educative activities relating to Communicable Disease.
- iv. Carrying out the activities of surveillance, prevention and control concerning communicable disease;
- v. Carrying out the activities of medical examination for prevention of communicable disease in cross-border entrance and exit of the country, international airport, seaport, other necessary airport, seaport and bus terminal;
- vi. Prohibition or restriction of movements at home, hotel, motel and guest house;
- vii. Isolation of infected person of communicable disease or suspect of being infected therewith;
- viii. Carrying out the activities of spraying, immunization by injection or orally and environmental sanitation necessary for prevention and control according to communicable diseases;
- ix. Giving advice to and coordinating with relevant Government departments, organizations and non-governmental organizations for construction of healthy housing, obtaining safe drinking water and fresh water for use, proper waste disposal in order to prevent occurrence of communicable disease for workers who are carrying out activities of social and economic development;
- x. Carrying out other functions prescribed by the Ministry of Health, from time to time.
- xi. When it is found that the Epidemic Disease or Notifiable disease is infectious and spreadable from one country to another quickly, the Ministry of Health shall carry out in conformity with International Health Regulation (IHR) issued by the World Health Organization.

Moreover, according to Section 11, in order to prevent and control the spread of a Principal Epidemic Disease, the Health Officer may undertake the following measures:

- (a) Investigation of a patient or any other person required;
- (b) Medical examination;
- (c) Causing laboratory investigation of stool, urine, sputum and blood samples to be carried out;
- (d) Causing investigation by injection to be carried out; and

- (e) Prohibition of the right of movement of the vehicle carrying animal or animal product suspected of having epidemic disease.

2.5.4. Occupational Safety and Health Law (15th March, 2019)

This law was enacted by Pyidaungsu Hluttaw with the notification No. 8/2019 in the Union of Myanmar on 15th March, 2019. The objectives of occupational health and safety law are:

- To implement the safety and health effectively in each sector;
- To reduce and mitigate suffering from injuries, diseases related to workplaces;
- To prevent from workplaces hazards, not encouraging workplaces diseases by employer, employee;
- To promote the productivity and to prevent occupational injuries and hazard following by occupational safety and health law;
- To create safety and health workplace through regard to suitable our national norm compared with international norm; and,
- To support the research for occupational health and safety development.

The occupational health and safety law prescribed in chapter (6), sub-Section (a), “Safety officer should appoint about the workplaces safety and health as a responsible person for safety workers by Factory.

Section 26 (a) of chapter (8) states that “the employer should manage and evaluate the necessary things in which machinery equipment hazards and dangerous measures,”. Further, Section 30 (a) states that” the employee should be used to right the personal protected equipment and its wearing according to regard of department for occupational safety and health by employer.

2.5.5. Prevention of Hazard from Chemical and Related Substances Law (26th August, 2013)

This law was enacted by Pyidaungsu Hluttaw with notification number 28/ 2013 on 26th August, 2013. The objectives of this law are expressed below.

- To protect from being damaged the natural environment resources and being hazardous any living beings by chemical and related substances;
- To supervise systematically in performing the chemical and related substances business with permission for being safety;
- To perform the system of obtaining information and to perform widely educative and research for using the chemical and related substance systematically;
- To perform the sustainable development for the occupational safety, health and environmental conservation.

Section 15 states that a person has to obtain a license before starting the respective chemical and related substances business. The followings are listed under Section 15.

- (a) Workplace shall be inspected for the safety and the power of resistance of the machinery and equipment by the respective Supervisory Board and Board of Inspection;
- (b) Workplace shall be attended by the person who serves in the work to the respective foreign trainings or the trainings and the expert trainings on prevention of hazard from the chemical and related substances opened by the government department and the government organizations.

Section 17 states that a person, who has obtained a licence, shall put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.

According to Section 22, a person who has obtained the registration certificate shall abide the regulations consisted in the registration certificate furthermore shall also abide the order and instructions issued occasionally by the Central Supervisory Board.

2.5.6. Myanmar Fire Brigade Law (17th March, 2015)

Myanmar Fire Brigade Law was enacted by the Pyidaungsu Hluttaw on 17th March, 2015. The objectives of this law are described below.

- To prevent destruction of State-owned property, private property, cultural heritage and the lives and property of the public by fire and other natural disaster;
- To organize the Fire brigade systematically and to train members of the fire brigade;
- To carry out extinguishing fire, prevention and search and rescue when fire, other natural disaster, epidemic disease or any kind of sudden disaster occurs;
- To educate, organize and incite extensively so as to achieve public cooperation when any disaster occurs;
- To participate and help, if necessary, for the State safety, peace of the public and the rule of law.

Section 25 states that any factory, Factory, bus stop, airport, port, hotels, motels, guest houses, high rise mixed used buildings, markets, offices, organizations, concerning fire risk owners or management person in accordance with fire department guidance:

- (a) No one can default to compose reserved fire force.
- (b) No one can absence to place fire safety equipment.

2.6. BIODIVERSITY AND RESOURCES CONSERVATION

2.6.1. Conservation of Biodiversity and Natural Protected Area Law (2018)

This law designates national parks and other protected areas to be Scientific Reserve, National Park Marine National Park, Nature Reserve, Wildlife Sanctuary, Geo-physically Significant Reserve, or Other Nature Reserve designated by the Minister. The objectives of this Law are described below.

- To implement the government policy for wildlife protection;

- To implement the government policy for natural areas conservation;
- To carry out in accordance with international conventions acceded by the State in respect of the protection and conservation of wildlife, ecosystems and migratory birds;
- To protect endangered species of wildlife and their natural habitats;
- To contribute to the development of research on natural science; and
- To protect wildlife by the establishment of zoological gardens and botanical gardens

2.6.2. Protection of Wildlife and Conservation of Natural Areas Law (8th June, 1994)

Ministry of Environmental Conservation and Forestry implements this Law on 8th June, 1994. The Law provides protection of wildlife and conservation of natural environment, and also implementation of policies and development of researches by the government for these.

2.6.3. Forest Law (3rd November, 1992)

Ministry of Environmental Conservation and Forestry implements this Law on 3rd November, 1992. The objectives of this law are described below.

- (a) To implement the forestry policy of the Government;
- (b) To implement the environmental conservation policy of the Government;
- (c) To promote the sector of public co-operation in implementing the forestry policy and the environmental conservation policy of the Government;
- (d) To develop the economy of the State, to contribute towards the food, clothing and shelter needs of the public and for perpetual enjoyment of benefits by conservation and protection of forest;
- (e) To carry out in accordance with international agreements relating to conservation of forests and conservation of environment;
- (f) To prevent the dangers of destruction of forest and bio-diversity, outbreak of fires, infestation of insects and occurrence of plant disease;
- (g) To carry out simultaneously conservation of natural forests and establishment of forest plantations; and,
- (h) To contribute towards the fuel requirement of the country.

2.6.4. The Law Relating to Aquaculture (7th September, 1989)

This law was enacted in the state law and order restoration council law notification number 24/89 on 7th September, 1989. In this law, Section 19 (b) states that obstructing navigation and flowing of water or pollution the water within the fisheries waters or abetting such acts.

2.6.5. Multi-different Kind of Biological Life and Environmental Protection Law (21st May, 2018)

The Pyidaungsu Hluttaw enacted Multi-different Kind of Biological Life and Environmental Protection Law on 21st May, 2018. The main objectives of the law are to

implement the State's strategies and policies regarding to biodiversity and environmental conservation, to comply with the international agreement for conservation of wild life, flora and fauna, ecosystem and migrant animals, to control the illegal trade of wild life and plants, and to build up the zoo and botanical garden to conserve the wild life and plants.

2.7. SURFACE AND GROUNDWATER LAWS

2.7.1. Conservation of Water Resources and River Law (2nd October, 2006, amended in 2017)

This law was enacted on 2nd October, 2006 then amended in 2017 with Pyidaungsu Hluttaw Law No.11. Section 8 states that no person shall carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks.

Section 11 states that no person shall:

- (a) Dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
- (b) Catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives.
- (c) Dispose of disposal soil and other materials from panning for gold, gold mineral dredging or resource production in the river and creek, into the river and creek or into the water outlet gully which can flow into the river and creek.

Section 19 states that no one shall dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk. Section 21 (b) states that no one shall: drill well or pond or dig earth without the permission of the Directorate.

Moreover, Section 22 states that no one shall, without the permission of the directorate, pile sand, shingle and other heavy materials for business purposes in the bank area and waterfront area. Section 24 (b) states that no one shall violate the conditions prescribed by the Directorate so as not to cause water pollution and change of watercourse in rivers and creeks.

2.7.2. Conservation of Water Resources and River Rules (27th January, 2013)

Ministry of Transportation enacted Conservation of Water Resources and River Rules on 27th January, 2013. The project proponent must, in accordance with the Rules:

- Construct the toilets far away from the river bank and sewage discharge to septic tank, under sub-rule (c) of rule 8;
- Avoid discharging sewage, engine oil, chemical, poisonous material, hazardous materials and other materials which may cause water pollution, under sub-rule (d) of rule 8; and
- Pay to prevent water pollution and to conserve the environment if water pollution and environmental impact is generated as a result of the project, under rule 9.

2.7.3. Underground Water Act (21st June, 1930)

This law was enacted in Burma act notification number IV on 21st June, 1930. Section 3 of the law states that no person shall sink a tube for the purpose of obtaining underground water except under and in accordance with the terms of a licence granted by the water officers.

Every person owning a tube which was in existence before the extension of this act to the local area concerned shall apply to the water officer for a licence for the said tube and such licence shall be granted free of charge.

In Section 6, the governor may make rules:

- (a) Prescribing the conditions subject to which licences may be granted by the water officer under Section 3;
- (b) Prescribing the form of and the procedure for granting such licences and the fees payable for the issue thereof;
- (c) Prescribing the information to be supplied to the water officer under Section 5.

2.8. LAND ACQUISITION AND RESETTLEMENT

2.8.1. Land Acquisition, Resettlement and Rehabilitation Law (24th August, 2019)

This law was enacted in Pyidaungsu Hluttaw notification number 24 in 24th August, 2019. The main objectives of this law are land acquisition, resettlement and rehabilitation. According to section 2; land is required for public purpose such as;

- (a) To lease land for development of private sector and government of national project;
- (b) For the reason of national defense and security affair;
- (c) Projects for socio-economic development;
- (d) To extend civilian settlement and development of infrastructure projects; and,
- (e) Matters to be considered in determining and amount or rate of compensation.

According to section 3 (s), resettlement is expressed as to negotiate between authority or organization of land acquisition proposal and person interested acquisition for arrangement of housing and infrastructure accordingly which of person interested acquisition of land.

According to section 3 (t), rehabilitation is program to rehabilitate of socio-economic for "person interested" acquisition of land. According by wish of them and consisting of (a) creation of jobs (b) vocational services (c) compensation for expertise at resettlement time.

2.8.2. Constitution of the Republic of the Union of Myanmar (2008)

The Constitution of the Republic of the Union of Myanmar was ratified and promulgated by the national referendum held in May, 2011. Some provisions that relate to land management and environmental conservation are included in the Constitution and summarized below. Section 37 states that:

- The union is the ultimate owner of all lands and all-natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union;
- The union shall enact necessary law to supervise extraction and utilization of State-owned natural resources by economic forces;
- The union shall permit citizens' right of private property, right of inheritance, right of private initiative and patent in accord with the law; and
- The union shall protect the privacy and security of home, property, correspondence and other communications of citizens under the law subject to the provisions of this Constitution.

2.8.3. The Land Acquisition Act (1894)

In accordance with this law, the government holds rights to take over the land provided that compensation is made to the original land owner. No private ownership of land is permitted and all land must be leased from the Union State. Nevertheless, Article 3 of the Act also stipulates that a person who has right over land would be entitled to claim compensation if the land was acquired under this Act and that: market value of the land; damage caused to the trees and crops; movable/immovable properties lost; inconvenience due to change in residence or business; and any diminution of profits of the land; shall be considered in determining the amount of compensation to be made.

2.8.4. Land Nationalization Act (1953)

This Act stipulates that the government holds rights to take over land provided that compensation is made to the original land owner. There is no private ownership of land and that all land must be leased from the Union State, according to the law.

2.8.5. Farmland Law (30th March, 2019)

This law was prescribed by the Pyidaungsu Hluttaw Law with the notification number 3 on 30th March in 2019. In Section 30 (b) of this law, in respect of application to use the farm land by other means for the interests of the public:

- (a) The Central Administrative Body of the Farm Land may permit to use the farm land by other means with the recommendation of the Region or State Administrative Body of the Farm Land;
- (b) The relevant Region or State Government Organization shall permit to use the farm land by other means except low land with the recommendation of the Region or State Administrative Body of the Farm Land.

2.8.6. Farmland Rules (2012)

The most relevant clauses under Farmland Rules (2012) are the ones below.

- If the farm land is requisitioned under Farmland Law for the interest of the state or the public the grievance and compensation for improving the farm land with buildings on the said farm land by the person who get the right to work farm land in the improvement made by the original person who get the right to work farm land,

without delay from the concern, the central farm land management committee shall conduct as necessary (Section 64).

- Township Farmland Management Committee shall calculate the amount of grievance and compensation to be given by the State or the Public and submit the statement of their amount to the Central Farmland Management Committee as follows (Section 67).

2.8.7. Vacant, Fallow and Virgin Land Management Law (2018)

In accordance with the Vacant, Fallow and Virgin Land Management Law (2018), the Central Committee shall make the following matters.

- If the person who has the right to cultivate or utilize submits that he has suffered from the dispute, obstruction, trespass or mischief by local cultivators in implementing the business, coordinate with relevant departments or organizations first. If the coordination does not lead to a settlement, the matter shall be brought up to the Court in accord with the law.
- If the land has previously been cultivated by local cultivators (i.e. local farmers) within the area of permitted vacant, fallow or virgin land, even if they do not have the legal rights to cultivate, negotiate or act by their own volition, their rights to cultivate will be respected.
- If there are local cultivators (i.e. local farmer) who already had the right to cultivate on the permitted vacant, fallow and virgin lands, cause to continue to carry out according to law with bilateral agreement.
- By the sub sections (a), (b) and (c), Central Committee shall make a decision to amend permission or to make suitable compensation based on the agreement of the both sides.

2.8.8. Registration of Deeds Law (20th March, 2019)

This law was enacted in Pyidaungsu Hluttaw notification number 9 on 20th March, 2019. Section 16 of the law states that the following deeds are defined as documents for which registration is compulsory according to this law:

- (a) Deeds which convey ownership of immovable property.
- (b) With regard to immovable property or attached items with a value of Ks 100,000 and above: their sale and [furthermore] non-testamentary documents that are made in order to create any right, title or interest by declaration, assignment, limitation, relinquishment or extinction; a judgment, decree or order made by a court with regard to the rights from such documents.
- (c) Mortgage deeds, with the exception of a mortgage by deposit of title deeds, with a value of Ks. 100,000 and above signed by the mortgagor and certified as correct by at least two witnesses; deeds that extinguish the mortgage.
- (d) Lease agreements for immovable property from year to year, or for any term exceeding one year, or reserving a yearly rent.

- (e) Deeds in which companies or organizations mortgage, transfer or convey by other means full or partial ownership of, or an interest in, immovable property to a trustee.
- (f) Kitimat adoption deeds.
- (g) Deeds specified by the Union government from time to time.

According to section 18; deeds that are submitted for registration at the Registration of Deeds Office-

- (a) Shall be written in the Myanmar language.
- (b) A translation signed by a notary public must be submitted if the deeds are not in the Myanmar language.
- (c) Shall be written and signed (as opposed to: initiated) by the parties.

Any amendment, addition, omission or deletion having been made to any contents of the deeds shall be signed or initiated by the parties.

2.8.9. The Boundaries Law (25th March, 2019)

This law was enacted in Pyidaungsu Hluttaw notification number 11 on 25th March, 2019. This law shall be called the boundaries law and be affected from the date of order by President of Republic of the Union of Myanmar. Aims of the law are described below.

- (a) To be carried out boundary survey, specify amendment of paddy field, plot, village, village tract, town, township, district, autonomy region, state and division of Myanmar.
- (b) To maintain and protect of survey post or boundary post from damage or change.
- (c) To amend survey post or boundary post which damage by weather, disaster or any other cause.

2.9. URBAN DEVELOPMENT AND MANAGEMENT

2.9.1. Development Committee Law (2013)

Development Committees of the major cities mean the organizations formed to carry out development works within a specified time limit in respective regions and states except for Yangon City and Mandalay City where specific laws exist. That includes development committees either for a township or for additional townships collectively for the purpose of development works. Development Committees' duties and functions include among others:

- Carrying out works for disposal of sewage;
- Carrying out precautionary measures against fire, flood, storm and natural disasters;
- Administration of slow-moving vehicles;
- Construction and maintenance of roads and bridges;
- Demolition of squatter buildings;
- Executing other development works in the public interest; and

- Carrying out other duties assigned by the regional government from time to time

2.9.2. Development Law of Bago Region (27th December, 2016)

Development Law of Bago Region was enacted on December 27, 2016 so as to effectively carry out development works in Bago Region. Bago City Development Law describes the formation of this law, duties and responsibilities of Bago City Development Committee such as urban and housing development planning, construction of buildings, drainage and roads, monitoring and management of markets, environmental conservation and cleaning, public health and safety, water distribution and sewage purification, management of livestock farming, production and distribution, and selling of meat and fish, killing of animals dangerous for the public, enforcement of tax collection, inspection, monitoring and penalties, administration of public recreation centers such as parks, playgrounds and gardens, construction and maintenance of bridges, collection of parking charges, management of ferry services, supervision of private loan business, and administration of offenses and penalties. As per this law, Bago City Development Committee may issue Procedures, Rules and Regulations with the agreement of Bago Regional Government and Notification, Orders, Instructions and Procedures in order to implement this law.

2.9.3. Myanmar Engineering Council Law (28th November, 2013)

This law was enacted by the Pyidaungsu Hluttaw Law with the notification No. 37, 2013 on 28th November, 2013. The purpose of the law is to ensure safety in technical and engineering works of the project. The project proponent needs to take into account the following sections. According to Section 31, the engineers, graduate technicians and technicians who have obtained registered certificates:

- (a) Shall abide by the rules, procedures, orders and directives issued under this law; and,
- (b) Shall follow and maintain the ethics of the engineers, graduate technicians and technicians stipulated by the Council

According to Section 37, any person without the registered certificate issued by the Council, except for engineering civil service personnel appointed by the government departments and government organizations carrying out public works, shall not practice engineering and technical works which may endanger public safety and which are stipulated under the rules made in this law.

2.9.4. The Electricity Law (27th October, 2014)

This law was enacted by the Pyidaungsu Hluttaw with the notification No.44 on 27th October, 2014. There are 16 chapters included in this law. According to the chapter 2 – section 3, the objectives of the law are described below.

- (a) To achieve further development in the electric power sector, to meet the State electric power demand and to supervise the electrical businesses by managing the electrical matters systematically in line with the Union Government policies;

- (b) To encourage the production and distribution of large-scale electric power that has the right to be managed by the Union in addition the production and distribution of both small and medium scale electric power in Regions and States;
- (c) To enable to use electric power safely and broadly;
- (d) To carry out the electrical business in accordance with the specified standards;
- (e) To encourage the local and foreign investment in the electrical business;
- (f) To enact fair, transparent and appropriate rules and regulations in order to prescribe the rates of electric power fee which are consistent with current times;
- (g) To have the right to use the electric power which has the standardized voltage, current, and frequency by the users of electric power and to protect from causing damages to the electrical equipment of users due to the electric power which is not consistent with standardization;
- (h) To adhere in accord with the international environmental protection treaties which Myanmar has ratified.

In addition to, the prohibitions of law are described in Chapter 12- Section 44 to 53 as the following:

- Section 44 states that no person shall operate the electrical business without permit.
- Section 45 states that no permit holder shall operate any other electrical business except the business contained in the permit.
- Section 46 states that no person shall operate the electrical installation and repair without obtaining the electrical professional certificate.
- Section 47 states that no person shall operate the generation, transmission, connection of electric power without obtaining the electrical safety certificate.
- Section 48 states that no person shall operate the importing, manufacturing in the country, exporting, distributing and selling of the electrical equipment which are not consistent with the prescribed norm and standard.
- Section 49 states that no permit holder shall operate the electrical business in collaboration with any other entity without the approval of the relevant department and organization.
- Section 50 states that no permit holder shall sell, mortgage, lease, exchange or transfer by any other means the permit the whole or any part of the business contained in the permit without the approval of the relevant Government department or Government organization which has issued the permit.
- Section 51 states that no person shall operate the construction of building, planting of trees or other activities within the area of the electric line.
- Section 52 states that no person shall connect waste; utilize the electric power without the permission of the permit holder.
- Section 53 states that no person shall divert the electric current, cut-off the electric power line destroy any equipment being used in any electrical business.

2.10. LABOUR LAWS

2.10.1. The Labour Organization Law (11th October, 2011)

This law was enacted by the Pyidaungsu Hluttaw with the notification No. 7 in 11th October, 2011. Section 3 describes that “every worker, who has attained the age prescribed in respective existing law to work in any trade or activity shall have the right to:

- (a) Join as a member in a labour organization and to resign from a labour organization according to their own desire;
- (b) Join as a member only in a labour organization formed according to the category of trade or activity relating to them.”

Moreover, Section 18 prescribed “the labour organization has the right to demand the relevant employer to re-appoint a worker if such worker is dismissed by the employer and if there is cause to believe that the reasons of such dismissal were based on labour organization membership or activities, or were not in conformity with the labour laws.”

The duties of employer are described in the following Sections.

- According to Section 29, the employer shall recognize the labour organizations of his trade as the organizations representing the workers.
- According to Section 30, the employer shall allow the worker who is assigned any duty on the recommendation of the relevant executive committee to perform such duty not exceeding two days per month unless they have agreed otherwise. Such period shall be deemed as if he is performing the original duty of his work.
- According to Section 31, the employer shall assist as much as possible if the labour organizations request for help for the interest of his workers. However, the employer shall not exercise any acts designed to promote the establishment or functioning of labour organizations under his domination or control by financial or other means.

2.10.2. The Employment and Skill Development Law (30th August, 2013)

This law was enacted by the Pyidaungsu Hluttaw with the notification No.29/2013 on 30th August in 2013. Section 15 describes that “Employer may:

- (a) In implementing programs of training to enhance the skills of workers, conduct in-house/ in-plant training, systematic on-the-job training, send his workers to outside training courses, conduct training by means of information technology either individually or in groups of employers for individual or groups of workers.
- (b) Employ young persons who have completed (16) years of age as apprentices in accordance with the regulations made by the Skills Development Agency and train them in the various skilled occupations.”

According to Section 25, the worker who has skills recognition certificate is eligible for participation in the relevant local and international skills competitions.

2.10.3. The Minimum Wage Law (22nd March, 2013)

This law was enacted by the Pyidaungsu Hluttaw with the notification No. 7/2013 in 22nd March, 2013. The purpose of the law is to meet with the essential needs of the

workers, and their families who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness.

Section 12 describes the duties of the employer in which:

- (a) Shall not pay wage to the worker less than the minimum wage stipulated under this Law;
- (b) May pay more than the minimum wage stipulated under this Law;
- (c) Shall not have the right to deduct any other wage except the wage for which it has the right to deduct as stipulated in the notification issued under this Law;
- (d) Shall pay the minimum wage to the workers working in the commercial, production and service business in cash. Moreover, if the specific benefits, interests or opportunities are to be paid, it may be paid in cash or partly in cash and partly in property, with prevailing regional price, jointly according to the desire of the worker;
- (e) In paying minimum wage to the workers working in the agricultural and livestock business, some cash and some property at prevailing regional price may be paid jointly according to local custom or desire of the majority of workers or collective agreement. Such payment shall be for any personal use and benefit of the worker and his family and the value shall also be considerable and fair.

About the rights of the workers relating to the minimum wage, Section 14 (a) was issued that “a worker working in any establishment relating to this law: has the right to obtain the minimum wage stipulated under this Law or, if the employer pay more than the said wage.

2.10.4. Payment of Wage Law (25th January, 2016)

This law was prescribed by the Pyidaungsu Hluttaw with the notification number in 25th January, 2016. Section 3 and 4 describe the methods of payment and time-frame. According to the Section 3,

The employer must:

- (a) Pay in local currency or foreign currency recognized by the Central Bank of Myanmar. This may be in cash, check or deposit into the bank account of Employee.
- (b) Moreover, pay can be in the means of:
 - (1) Totally in cash OR half the cash and half in things set according to the local price to those employees working in trade, manufacturing and service sectors.
 - (2) Totally in cash OR half the cash and half in things set as local price according to local traditions or common agreement to those working in agriculture and livestock sectors.
 - (3) An employee shall receive the payment for 60 days when he/she is in Alternative Civil Service.

Section 4 describes that an employer must pay for-

- (a) Part-time, daily, weekly or other part-time job, temporary or piecework when the work is done or at the agreed time.
- (b) According to the Article (a), the time frame shall not exceed one month.
- (c) Wages for the permanent work must pay per monthly basis.
 - (1) Must pay at the end of the payment period when there are not more than 100 workers.
 - (2) If there are 100 workers and above, pay must not be administered later than 5 days after the end of the payment period.
- (d) Upon termination, wages must be paid within 2 days from the date of termination.
- (e) If a resignation letter is submitted, wages must be paid at the ending day of the payment period.
- (f) If an employee dies, wages must be paid to the legally recognized heir within 2 working days after the day he/she has died.
- (g) All wages must be paid during the working day.

Section 14 states that the worker has the right to enjoy overtime wages stipulated by the law if he works over time

2.10.5. The Settlement of Labour Dispute Law (28th March, 2012)

This law was enacted by the Pyidaungsu Hluttaw with the notification No.5/2012 in 28th March, 2012. The purpose of the law is to safeguard the right of workers or to have good relationship between employer and workers and to make peaceful workplace or to obtain the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly.

- In Section 23, "A party, employer or worker, may complain individual dispute relating to his grievance to the Conciliation Body and if he is not satisfied with the conciliation of such body in accord with stipulated manners, may apply to the competent court in person or by the legal representative." The prohibitions of the law are described in the following.
- According to Section 38, no employer shall fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause.
- According to Section 42, no person shall prohibit the right to work independently of the workers who are not desirous to participate in the strike nor impede the right of a worker to strike.

2.10.6. The Leave and Holiday Act, 1951 (Law Amended on July, 2014)

The Leave and Holidays Act was firstly adopted on 1st January in 1952, by the International Labour Organization, Myanmar. Recently, the Act was amended in July 2014. The key objectives of this Act are to allow workers (daily wage worker/temporary worker/permanent worker) to have a leave and holiday allowances, religious or social activities with earn allowance, and health insurance allowances.

The rights of workers to leave and have a holiday are described below.

- Causal Leave (6 days)
- Earned Leave (10 days)
- Medical Leave (30 days)
- Maternity leave
- Public Holiday (21 days)
- Penalty for Violation

2.10.7. Social Security Law (31st August, 2012)

This law was enacted by the Pyidaungsu Hluttaw with the notification No.15/2012 in 31st August, 2012. The purpose of the Social Security Law is to ensure the project proponent supports development of workers' social security and to enable them to fulfill their health needs. According to Section 15 (a), the following are included in the Social Security Funds:

- Health and social fund;
- Family assistance fund;
- Invalidity benefits, superannuation benefit, and survivors' benefit fund;
- Unemployment benefit fund;
- Other social security fund for social security system of compulsory registration and contribution stipulated by the Ministry of Labour in co-ordination with the Social Security Board, under Clause (ii) of Sub-Section (e) of Section 13;
- Other social security fund stipulated that contribution may be paid after voluntary registration under clause (ii) of sub-Section (e) of Section 13; and
- Social Security Housing Plan Fund
- According to Section 18 (b), the employer shall deduct contributions to be paid by workers from his wages together with contributions to be paid by him and pay to the social security fund. The employer shall also cover the expense for such contributions.
- According to Section 48 (a), the employer shall affect insurance by registering at relevant township social security offices in order to get employment injury benefit of the workers applied to provisions of compulsory registration for employment injury benefit insurance system contained in Section 45 and by paying contributions to employment injury benefit fund in accord with the stipulations.
- According to Section 48 (b), the employers may affect insurance by registering voluntarily for the workers who are not applied to provisions of compulsory registration for employment injury benefit insurance system and by paying stipulated contribution to employment injury benefit insurance fund.

2.10.8. The Rights of the Persons with Disabilities Law (9th June, 2015)

This law was enacted by the Pyithu Hluttaw with the notification No.30/2015 in 9th June, 2015. The objective of the law is to protect and respect the rights of persons with

disabilities in Myanmar in a way that is recognized internationally under the UN Convention. According to Article 14 of the law, the persons with disabilities shall:

- (a) Have the rights to access education, attain and use the information, and receive medical care;
- (b) Have the human rights and other fundamental freedoms such as freedom of speech, freedom to survive, and to worship on an equal basis with others;
- (c) Have the rights to own the legal money, properties and housing, buildings, right to inherit, and live in the housing of the public housing projects;
- (d) Have the right to request for the necessary arrangements for the rights to sue, to be sued, to defend, and to be investigated as a witness at the court;
- (e) Have the right to exemption from the office tax in suing for the rights and entitlement; and
- (f) Have the right to services and protection from the torture, discrimination, negligence, and bullying in prison due to the disability

With regards to mobility and accessibility, Article 28 stipulates that the National Committee shall carry out negotiation and implementation for easy accessibility and mobility for persons with disabilities by cooperating with relevant Union Ministries, Municipal Committee (or Township Development Committee), States and Regional Governments, NGO and Private Organizations and entities which work on disability, as follows:

- (a) Laying down the directives on the production and renovation for easy access to public buildings and environments/surroundings for the persons with disabilities with physical and mental security;
- (b) Drawing models/structures and carrying out construction with the mobility aids and devices for easy access to public places without barriers for person with disabilities;
- (c) Arranging necessary measures for easy access to public transportation for the persons with disabilities;
- (d) Installing signs, symbols, sound devices, and other necessary devices at the traffic lights, pedestrian crossing, and roads with curves, ascending and descending points to provide easy access for the persons with disabilities; and
- (e) Making arrangements for the persons with disabilities to be able to easily access physical surroundings such as public housing, hospital and schools and communication, information and public communication sectors

In terms of job opportunities, Article 36 states that the employer shall:

- (a) Obey and implement the policies and plans set up by the National Committee regarding job opportunities of persons with disabilities;
- (b) Employ the persons with disabilities with employability for appropriate work depending on the type of employment in accordance with the quota for the number of people with disabilities specified by the National Committee;
- (c) Choose and employ the persons with disabilities registered at Employment Exchange Offices in relevant townships and departments in accordance with sub-Section (b);
- (d) Make appropriate arrangements including interviewing, the equal rights for salaries and opportunities, promotion, job security, access to free vocational education and training based on employability of the persons with disabilities;
- (e) Pay the amount of money to the funds related to the rights of the persons with

disabilities when impossible to employ in accordance with the quota for the number of people with disabilities as specified in sub-Section (b); and

- (f) Submit the list of the employed staff or workers with disabilities and the vacant positions to the Department and the Employment Exchange Offices in the relevant township in accordance with sub-Section (b).

2.10.9. Child Rights Law (23rd July, 2019)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 22 in 23rd July, 2019. The main purposes are to develop the child's health, nutrition, education opportunities, and to protect from abandonment and abuse, and neglect by the State, volunteers, NGOs.

2.11. PROTECTION AND PRESERVATION LAWS

2.11.1. The Protection and Preservation of Cultural Heritage Region Law (28th February, 2019)

This law was enacted by the Pyidaungsu Hluttaw with the notification No.6/2019 in 28th February, 2019. The purpose of the law is to ensure protection of cultural heritage and the cultural heritage area from damages caused by natural and man-made disasters. Any cultural heritage located near the project area shall be protected as specified below.

Section 15 states that a person desirous of carrying out one of the following shall abide by the provisions of other existing laws and also apply in accordance with the stipulations of the Department to obtain prior permission under this law.

- Renovation of a building other than an ancient monument or extension of the boundary of its enclosure in the ancient monumental zone or an ancient site zone
- Within the protected and preserved zone, constructing, extending, renovating a building other than a hotel, motel, guest house, lodging house or industrial building or extending the boundary of its enclosure
- Digging well, pond and fish-breeding pond or extending the same within the cultural heritage region

Section 18 states that no person shall, without prior permission granted under this law, construct, extend, renovate a building or extend the boundary of its enclosure in the ancient monumental zone or ancient site zone.

Section 19 states that no person shall, without prior permission granted under this law, carry out construction, extension, renovation, or extension of the boundary of its enclosure with respect to a building within the protected and preserved zone.

Section 20 states that no person shall carry out any of the following in the cultural heritage region.

- Destroying an ancient monument
- Willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument
- Excavating to search for antiquities
- Exploring for petroleum, natural gas, precious stones or minerals

Section 21 states that no person shall, without prior permission granted under this law, carry out the following in the cultural heritage region.

- Carrying out renovation and maintenance work on an ancient monument
- Carrying out archaeological excavation
- Building road, constructing bridge, irrigation canal, embankment or extending the same
- Digging well, pond, fish-breeding pond or extending the same

Section 22 states that no person shall construct a building which is not in conformity with the conditions prescribed region wise by the Ministry of Culture in the cultural heritage region.

Section 23 states that no person shall plough and cultivate or carry out any activity which may cause damage to the cultural heritage within the boundary notified by the Department in the cultural heritage region.

2.11.2. The Protection and Preservation of Ancient Monument Law (26th August, 2015)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 51/2015 in 26th August, 2015. According to Section 12, the person who found the ancient buildings over 100 years on the ground or under the ground or on the water or under the water to the owner or without maintained person that buildings may be known or assumed the ancient buildings must inform early to the respective ward administrator or village administrator. Section 15 states that the person who made the following things in the regarded area of the ancient buildings should apply to the department in advance allowance;

- (a) Extension of villages, wards and towns;
- (b) The new building construction or extensions or preparation or fencing or annexes including hotels, factories, residential buildings;
- (c) Oil and gas, gem or digging for mineral exploration, connecting to oil and gas pipe line, connection to grid lines, construction of communication tower, road construction, bridge construction, airport construction, dam like the construction or extension of principle buildings;
- (d) Connection of electric line in the ground, connection to communication and other underground workings;
- (e) Digging or extension of well, lake, channel, husbandry pond;
- (f) Surface damaging like gold bars, excavation, making bricks, digging of well, pond, creek, drain, chasm, valley, landfills, adjusting ground, mine explosion, mining, gravel, sand extraction, demolition of hill and mountain;
- (g) Fencing or installation of the private area or community;
- (h) Construction of unfix discipline building regarded by the ministry in each regionally near the ancient buildings and environmental view.

Section 20 (b) states that nobody should not do without prior permission letter in the ancient building or historical heritage building to regarded area assumed to damage the ancient building due to causing vibration by using heavy machines or vehicle traffic in the regarded area near the historical ancient buildings.

2.11.3. The Protection and Preservation of Antique Object Law (2015)

The purpose of the law is to ensure the protection of antique object and its information if it was found in the project area. According to the law, the person who finds any object which has no owner or custodian shall promptly inform the relevant Ward or Village-Tract Administrator if he knows or it seems reasonable to assume that the said object is an antique object (Section 12).

2.12. OTHER RELATED LAWS AND REGULATIONS

2.12.1. The Factories Act (1951, Amended in 20th January 2016)

This Act was enacted in 1951 with the name “The Factories Act” and later amended in 20th January 2016. The purpose of the law is to ensure occupational safety and health of the workers in the work place and to maintain social security of the labour. According to the law:

- Section 14 states that the project owner will carry out in an environmentally friendly manner disposal of wastes, liquid and pollutants under sub-Section 1.
- Section 37 states that the project owner will arrange and comply with the existing environmental standards at the factory in order to reduce noise, health impacts and accidents; and
- Section 43-1 states that the project owner will allow to attend the occupational health and safety training for the purpose of work-related accidents and occupational health risk reduction.

2.12.2. The Myanmar Excise Act (1st October, 1917, Amendment: 22nd December 2015)

This Act was enacted in 1st October, 1917 with the name of “The Burma Excise Act” and later this Act was amended and enacted by the Pyidaungsu Hluttaw with the notification number 66/2015 in 22nd December 2015 with the name of “The Myanmar Excise Act”. In the amendment Act, the word “the Excise Commissioner” is substituted to “the Director General Administration Department”. In addition, the word “the Excise Department” is substituted to “the General Administration Department”.

According to Section 7, no excisable article shall be imported, exported or transported, except-

- (a) After payment of any customs or excise duty to which it may be liable or execution of a bond for such payment; and
- (b) On compliance with such conditions as the President of the Union may impose.

According to Section 9, no excisable article exceeding such quantity as the President of the Union may prescribe by notification shall be imported, exported or transported, except under a pass issued under the provisions of section 10: Provided that

in the case of duty-paid foreign alcoholic liquor such passes shall be dispensed with unless the President of the Union shall by notification otherwise direct.

According to Section 11, no person shall cultivate or collect the hemp plant (Cannabis Sativa), or any plant specified as an intoxicating drug by notification under section 2 (l) (iv), except under and in accordance with the conditions of a special licence granted by the President of the Union.

According to Section 12, except under the authority and subject to the conditions of a licence granted under this Act-

- (a) No excisable article shall be manufactured or collected;
- (b) No distillery or brewery shall be constructed or worked; and
- (c) No person shall use, keep or have in his possession any materials or apparatus whatsoever for the purpose of manufacturing any excisable article.

According to Section 14, the Director General of the General Administration Department may-

- (a) Establish premises in which alcoholic liquor may be manufactured under a licence granted under Section 12;
- (b) Sanction the construction and working of a distillery or brewery; and
- (c) Establish or sanction the establishment of a warehouse wherein any excisable article may be deposited, bottled or kept without payment of duty.

According to Section 22;

(1) No person who is licensed to sell foreign alcoholic liquor or country spirit for consumption on his premises shall, during the hours in which such premises are kept open for business, employ or permit to be employed, either with or without remuneration, any person under the age of sixteen years in any part of such premises in which such alcoholic liquor or spirit is consumed by the public.

(2) No person who is licensed to sell foreign alcoholic liquor for consumption on his premises shall, during the hours in which such premises are kept open for business, employ or permit to be employed, either with or without remuneration, any woman.

According to Section 30, whoever, in contravention of this Act or of any rule, notification or order made or of any licence, permit or pass shall be punishable with imprisonment for a term from a minimum of six months to a maximum of two years, or shall be liable to fine with a minimum of one million kyats to a maximum of two million kyats or with both.

2.12.3. Boiler Law (14th July, 2015)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 39/2015 in 14th July, 2015. The main objectives of this law are to provide the boiler which is standardized with Myanmar or international rules and regulations, to protect and minimize the risk of occupational health and safety due to boiler, to upgrade the technology of boiler and to decrease the negative environmental impacts on the environment and public health.

2.12.4. The Consumer Protection Law (14th March, 2014)

This law was enacted by the Pyidaungsu Hluttaw Law with the notification number 10 in 14th March, 2014. The objectives of the Consumer Protection Law are as follows:

- (a) To enable to understand and claim the own rights as a consumer and not to cause sufferance from fraud in using the goods and service;
- (b) To cause occurrence of a system effectively protect the rights of the consumer;
- (c) To cause occurrence of consumer protection scheme including protecting by Law distributing and informing correct and transparent information to the consumer;
- (d) To cause behaviours taking responsibility in carrying out with regard upon consumer protection activity by the entrepreneur;
- (e) To cause fulfillment of goods and services that enable to ensure the high quality for safety, health, satisfaction of the consumer.

This law was described in section 7 (a); The right of the entrepreneur are as follows;

- i. Receiving payment in accord with agreements, value in sale of goods or services;
- ii. Having right of defence under law in consumer dispute;
- iii. Enabling to make regain of goodwill if the injury and loss of the consumer is not because of this goods or services;
- iv. Enbling to regain goodwill if it is provable in accord with the law that the injury and loss of the consumer is not because of goods or services that he has purchased;

This law was described in section 7 (b); he duties of the entrepreneurs are as follows:

- i. Acting the business accord with business ethics;
- ii. Giving clear and proper information on goods or services;
- iii. Treating honestly and properly with non-discrimination to the consumers;
- iv. Guaranteeing the goods or services traded or produced based on stipulated standard and quality;
- v. Providing opportunity to test on goods or services which require to test quality before purchasing;
- vi. Taking responsibility as guaranteed in respect of damage due to consuming goods or using services during the warranty period;
- vii. Taking responsibility as agreed terms and conditions if received or used goods by consumer are inconsistent with the agreement;
- viii. Complying exactly with the agreed agreement or promise in the agreement in doing service business;
- ix. Avoiding the saying, writing and acting to cause detriment on the relevant consumer by means of media or by other means while relevant person is settling the consumer dispute.

2.12.5. Natural Disaster Management Law (31st July 2013)

This law was enacted by the Pyidaungsu Hluttaw Law with the notification No. 21, 2013 in 31st July 2013. section 13 describes that," the department, organization or person that has been assigned under this Law:

- (a) Shall undertake the following functions after laying down the plan in accord with the natural disaster management plans in order to reduce damage and losses that are likely to be caused by the natural disaster;
 - Preparatory and preventive measures for natural disaster risk reduction before the natural strikes;
 - Emergency responses including search and rescue when the natural strikes;
 - Rehabilitation and reconstruction activities for improving better living standard in past disaster period and conservation of the environment that has been affected by natural disaster;
- (b) Shall give prioritize and protect children, the elderly, the disabled and women (especially pregnant women and suckling mothers) in carrying out the functions contained in sub-section (a);
- (c) Shall refrain from the act that causes injuring human dignity in supporting the victims.

2.12.6. Law on Standardization (3rd July, 2014)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 28/2014 in 3rd July, 2014. According to the section 17, the person who have acquired qualified certificate shall apply to the recognized department or organization of the government department. In section 19, if the qualified person who breaking any relevant certified including rules and disciplines was inspected, the committee could decide any following action.

- (a) Notification
- (b) Suspension by the limited of the qualified certificate
- (c) Decommission of the qualified certificates.

About the Penalties section 26 was prescribed in which any certified person was using the qualified mark on the unfixed products or services, that person should be punished not more than one-year prison or one million or both.

2.12.7. The Export and Import Law (17th September, 2012)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 17/2012 in 17th September, 2012. The main objectives of this law are to successfully implement the State economic principles, to enable to establish the policies to support the State development, to cause the State's import and export policies and activities to be in compliance with the international trade standards.

2.12.8. Myanmar Investment Law (18th October, 2016)

This law was enacted by the Pyidaungsu Hluttaw with the notification number 40/2016 on 18th October in 2016. The objectives of this law are described below.

- To develop responsible investment businesses which do not cause harm to the natural environment and social environment in the interest of the Union and its citizens;
- To protect the investors and their investment businesses in accordance with the Law;
- To create job opportunities for the people;
- To develop human resources;
- To develop highly functioning production, service, and trading sectors;
- To develop the technology, the agriculture, livestock and industrial sectors;
- To develop various professional field, including infrastructures around the Union;
- To enable the citizens to be able to work alongside with the international community;
- To develop businesses and investment businesses that meet international standards

In Section 50(d), the land use right is included which means the investor shall register the land lease contract at the Office of Registry of Deeds in accordance with the Registration Act. In Section 51, the investor:

- (a) May appoint of any citizen who is a qualified person as senior manager, technical and operational expert, or advisor in his investment within the Union in accordance with the laws;
- (b) Shall appoint them to replace, after providing for capacity building programs in order to be able to appoint citizens to positions of management, technical and operational experts, and advisors;
- (c) Shall appoint only citizens for works which does not require skill;
- (d) Shall appoint skilled citizen and foreign workers, technicians, and staff by signing an employment contract between employer and employee in accordance with the labor laws and rules;
- (e) Shall ensure to obtain the entitlements and rights in the labor laws and rules, including minimum wages and salaries, leave, holidays, overtime fees, damages, compensation of the workman, social welfare, and other insurance related to workers in stipulating the rights and duties of employers and employees and occupational terms and conditions in the employment contract;
- (f) Shall settle disputes arising among employers, among workers, between employers and workers, and technicians or staff in the investment in accordance with the applicable laws.

According to Section 65, the more important to the projects investors responsibilities was directed in sub-Section (f) to (q);

- (f) Shall not make any significant alteration of topography or elevation of the land on which he is entitled to lease or to use, without the approval of the Commission;
- (g) Shall abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;
- (h) Shall list and keep proper records in books of accounting and annual financial statements, and necessary financial matters relating to the investments performed by a Permit or an Endorsement in accordance with internationally and locally recognized accounting standards;
- (i) Shall close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;
- (j) Shall pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason;
- (k) Shall pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work;
- (l) Shall supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;
- (m) Shall respect and comply with the labor laws;
- (n) Shall have the right to sue and to be sued in accordance with the laws;
- (o) Shall pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement.
- (p) Shall allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment;
- (q) Shall take in advance a Permit or an Endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment. Such investments shall be submitted the situation of environmental and social impact assessment to the Commission during the permitted investment period.

Moreover, this law was instructed the investor shall insure the types of insurance stipulated in the provision of the rules at any insurance enterprise which is entitled to carry out insurance businesses within the Union in Section 73.

2.12.9. Myanmar Investment Rules (30th March, 2017)

This rule was prescribed by Ministry of Planning and Finance with notification 35/ 2017 in 30th March. 2017. In this law, the investor must comply with the conditions of the Permit and other applicable laws when making an Investment and shall fully assist while negotiating with the Authority for settling the grievances of the local community that have been affected due to Investments in Section 203.

According to Section 206, If the Investor is desirous to appoint a foreigner as senior management, technician expert or consultant. According to Section 51 (a), the investor shall submit such foreigner's passport, expertise evidence or degree and profile to the Commission Office for approval.

2.12.10. Myanmar Insurance Law (23rd July, 1993)

This law was enacted by the State Law and Order Restoration Council on 23rd July in 1993. The objectives of the law are described below.

- To overcome financial difficulties by effecting mutual agreement of insurance against social and economic losses which the people may encounter, due to common perils;
- To promote the habit of savings individually by effecting life assurance, thus contributing to the accumulation of resource, of the State;
- To win the trust and confidence of the people in the insurance system by providing effective insurance safeguards which may become necessary in view of the social and economic developments.

In Section 15; owners of motor vehicles shall affect compulsory Third Party Liability Insurance with the Myanmar Insurance. An entrepreneur or an organization operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may cause pollution to the environment shall affect compulsory General Liability Insurance with the Myanmar Insurance under this law according to Section 16.

2.12.11. Private Industrial Enterprise Law (26th November, 1990)

This law was enacted by the State Law and Order Restoration Council in 26th November, 1990. This law was described in section (4);

- (a) Any person desirous of conducting any private industrial enterprise;
- (b) Any person conducting any private industrial enterprise on the day this Law is enacted; by using any type of power which is three horsepower and above or manpower of ten wage-earning workers and above shall register under this Law.

According to section 13, some more important duties of the entrepreneur are as follows -

- (b) Shall abide by the terms and conditions of the registration certificate;
- (f) Shall shift the place of enterprise, change the nature of enterprise, amalgamate enterprises and split up enterprises only with the approval of the Directorate;

- (g) Shall abide by the orders and directives issued from time to time by the Ministry and the Directorate;

Moreover, section 15(a) and (b) was described that the entrepreneur has the right to carry out the followings: -

- (a) Appointing foreign experts and technicians with the approval of the Ministry;
- (b) Carrying out change of the name of enterprise, transfer of ownership, temporary suspension or permanent closing down of the enterprise in the manner prescribed and with the approval of the Directorate.

2.12.12. The Petroleum and Petroleum Product Law (1st August, 2017)

This law was enacted by the Pyidaungsu Hluttaw with notification number 20/2017 on 1st August in 2017. The objectives of this law are expressed below.

- To carry out the petroleum and petroleum product businesses activities systematically in accordance with the provisions of the law, stipulated standards, procedures and conditions;
- To enable the petroleum and petroleum product business activities to carry out safely without environmental impact;
- To establish free and fair competition in carrying out petroleum and petroleum product business activities;
- To secure energy requirement and energy security of the Union;
- To obtain tax revenue of the Union.

Section 9 states that the Ministry of Transport and Communications shall carry out the following functions relating to the projects in which sub-Section (a) and (e) to any petroleum and petroleum product;

- (a) Issuing license to vehicles, vessels and barges that carry any petroleum and petroleum product;
- (b) Determining procedures and conditions to be abided by in carrying out transport business except transport by pipeline.

Moreover, in Section 10, The Ministry of Natural Resources and Environmental Conservation shall carry out the following functions relating to any petroleum and petroleum product;

- (a) Issuing license for the right to store for the storage tanks and warehouses;
- (b) Issuing transport permit for the vehicles, vessels and barges that shall carry any petroleum and petroleum product;
- (c) Determining the period, form and terms and conditions, manners of applying license, permitting authority and fees to be assessed, for license under sub-Section (a) and permit under sub-Section (b);
- (d) If it occurs environmental impacts in carrying out petroleum and petroleum product business activities, taking action, as necessary, in accordance with the existing laws of on-site inspection;

- (e) Determining, in coordination with ministries concerned, procedures and conditions relating to standard and quality of storage tanks and warehouse, and tanks of vehicles, vessels and barges that carry any petroleum and petroleum product.

Section 11 states that on all receptacles containing any dangerous petroleum and petroleum product, the warning sign of danger by stamping, embossing, painting, printing or any other means shall be expressed. If it is impossible to express as such, similar warning signs of the nature of danger of gasoline, spirit or petroleum shall be expressed in writing at the sensible place in salient words or signs near the receptacle.

2.12.13. The Motor Vehicle Law (7th September, 2015)

This motor vehicle law was enacted by the Pyidaungsu Hluttaw with notification number 55/2015 on 7th September in 2015. The objectives of the law are described below.

- To register motor vehicles which are safely accessible to the public place after inspecting in accord with the stipulations;
- To issue a driving licence to drivers after examining whether or not they meet the prescribed qualifications according to the types of motor vehicles;
- To be easy to access road users and to protect the safety of vehicle and road;
- Not to be traffic jam and to use the effective Intelligent Transportation System for the safety of vehicle;
- To perform the reduction of environmental impacts arising from a motor vehicle.

Section 45 states that no one is allowed to drive, request someone to drive, or park, motor vehicles in public places under the following conditions:

- (a) The motor vehicle is not registered.
- (b) The registration has been suspended, revoked or expired; the registration card is not displayed.
- (c) The registration card has been revoked or is expired.”

2.12.14. Trademark Law (30th January, 2019)

This law was prescribed by the Pyidaungsu Hluttaw Law with the notification number 3 in 30th January, 2019. This law was described in section 3, the department shall perform the following functions:

- (a) make announcements on trademark rights related registration matters;
- (b) According to section 17, “the applicant for the registration of a mark shall:
 - i. Includes the following in the application:
 - ii. An application for registration;
 - iii. Name and address of the person or legally formed organization applying for registration;
 - iv. Name citizenship scrutiny card number, and address of the agent or representative if the applicant entrusts an agent or representative with this matter;
 - v. A clear and complete description of the mark;

- vi. Name and type of goods and services for which a request for registration is made and the category of international mark classification to which it belongs;
- (c) In addition to the requirement in subsection (a), the following must be attached to the application if necessary:
- i. If the application is made for a legally formed organization, the registration number, type and country of said organization;
 - ii. If the applicant requests the right of priority, an application for the right of priority together with sufficient evidence proving that he has the right of priority, and description;
 - iii. If the applicant requests the right of priority for trade exhibitions, an application for the right of priority for trade exhibitions together with sufficient evidence proving he has the right of priority for trade exhibitions, and description;
 - iv. If the mark is registered at the document's registration office, documentary evidence proving such registration;
 - v. other requirements stipulated by the Agency and the Department from time to time.

2.12.15. The Myanmar Companies Law (6th December, 2017)

This law was enacted in Pyidaungsu Hluttaw notification number 29 at December 6, 2017. In accordance with this law, section 4 was pointed in essentials requirements of companies. In this sub-section (a) has shown –

- i. A name;
- ii. A constitution;
- iii. At least one share in issue (provided that a company limited by guarantee need not have a share capital);
- iv. At least one member;
- v. Subject to sub-section (vi), at least one director who must be ordinarily resident in the Union;
- vi. If the company is a public company, at least three directors, at least one of whom must be ordinarily resident in the Union; and
- vii. A registered office address in the Union.

In subsection (b) has enacted –

A company may:

- i. Appoint a company secretary; and
- ii. Have a common seal.

2.12.16. Commercial Tax Law (24th March, 2014)

This law was prescribed in 31st March, 1990 and its amended in 2014, March 24. According to this law, section 4(a) of chapter II was shown in which Charging Tax and Having Responsibility to Pay Tax: "The tax shall be charged on the goods produced in the country as mentioned in the Schedule." In section 5, the tax due under section 4 shall be responsible to be paid by the relevant producer, service provider or importer.

In the schedule 7, the tax percentage on the services including railways, waterway, airway, and road transport business are 5 percent based on the total receipts in respect of passenger fares.

2.12.17. The Specific Goods Tax Law (18th January, 2016)

This law was enacted by the Pyidaungsu Hluttaw Law No.11, 2016. The provisions contained in this Law shall have effect within the whole country commencing from 2016-2017 financial year. According to Section 4(a); Any person shall be charged the tax prescribed in the schedule of this Law for the following activities:

- i. Importing specific goods into the country;
- ii. Manufacturing specific goods in the country;
- iii. Exporting specific goods abroad.

According to Section 5; In respect of the specific goods chargeable to tax under Section 4:

- (a) if imported,
 - i. the importer shall pay specific goods tax;
 - ii. the Customs Department shall collect the tax to be paid under subsection (i) together with the customs duty as the manner of the collection of customs duties;
- (b) If manufactured in the country, the specific goods manufacturer shall pay tax;
- (c) If exported, the specific goods exporter shall pay tax.

CHAPTER 3 PROJECT DESCRIPTION

3.1. PROJECT INFORMATION

Carlsberg enters a joint venture with local partner MGS in order to construct a new brewery, Myanmar Carlsberg. Carlsberg launches four brands in Myanmar, Carlsberg, Tuborg, Black Eagle and YOMA. The initial stage for new brewery construction was started in 2013 and finished in 2015 with two years construction period. The official investment period for Carlsberg Myanmar is 50 years whereas the total investment budget is the equivalent of 37 million USD in Myanmar Kyats. The brewery factory facilities and structure are arranged to meet the international standard. The project is located at Block 3 to 13, Industrial zone (Foreign), Bago Township, Bago Region, Myanmar. The location of the project is 17° 15' 28.65" N and 96° 27' 13.51" E. The total area of land is 53.75 acres which is equivalent to 218,000 m². Location and master layout plan of the factory are described in Figure 3-1 and Figure 3-2.

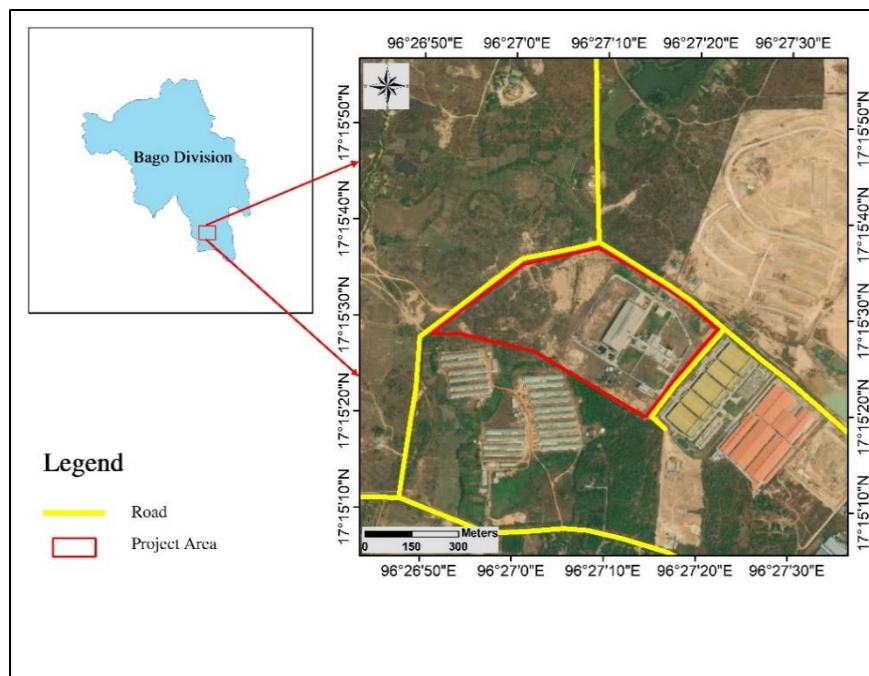


Figure 3-1 Project Location Map

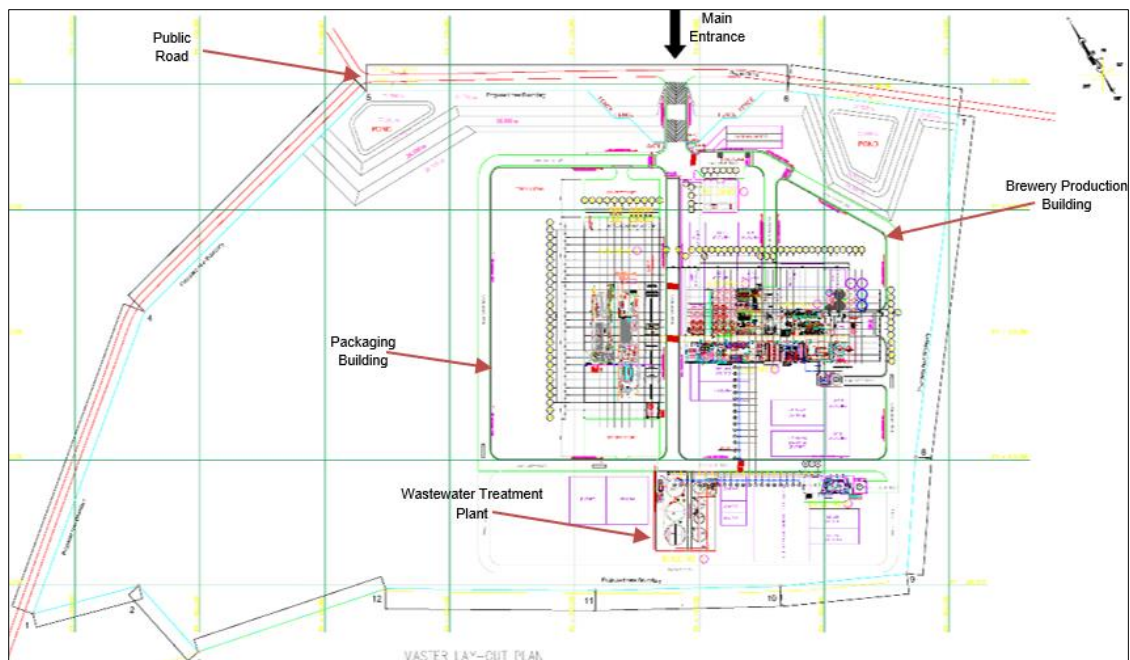


Figure 3-2 Layout Plan of the Factory

3.2. RAW MATERIAL REQUIREMENTS

In the production of brewery, malt and rice, yeast, sugar, as well as other supportive materials are the main type of raw materials. The amount of packaging materials requirement is mainly depended on the market demand. Although the majority of raw materials are local products, some are also imported from overseas. There are altogether 36 number of products produced by the factory and annual requirement of raw materials required for all products are expressed in the following Table 3-1.

Table 3-1 List of Annual Raw Materials to be Imported

No.	Item	Quantity	Unit per year
1.	Liquid CO ₂ Tanker	20,000	Kg
2.	Diesel	1,317,664	Liter
3.	Empty-Cans-YOMAPremiumBrew-330ml	1,119,400	PCS
4.	Empty-Cans-TuborgGreen-330ml	396,471	PCS
5.	Empty-Cans-Carlsberg-330ml	46,113	PCS
6.	Cans-Lion-Stout-330ml	7	PCS
7.	Empty-Cans-YOMASpecialBrew-330ml	11,656,338	PCS
8.	Empty-Cans-BlackStout-330ml	396,369	PCS
9.	Empty-Cans-TuborgClassic-330ml	1,663,165	PCS
10.	Empty-Cans-YOMASpecialBrew-500ml	13,064,752	PCS
11.	Empty-Cans-YOMAPremiumBrew-500ml	588,930	PCS
12.	Empty-Cans-Tuborg-Green-500ml	608,553	PCS
13.	Empty-Cans-YOMAEExtraStrong8%-500ml	5,609,769	PCS
14.	Empty Can-Black Eagle-500ml	6,200	PCS
15.	Empty-Cans-Singha-500ml	7	PCS

No.	Item	Quantity	Unit per year
16.	Empty-Cans-Singha-500ml	7	PCS
17.	Empty-Cans-TuborgClassic-500ml	300,000	PCS
18.	Can Lids- Brewery (Promotional)	9,315,747	PCS
19.	Can Lids- Brewery	45,455,929	PCS
20.	Carton-Carlsberg-330ml-Bottle	4,664	PCS
21.	Carton-Tuborg-640ml-Bottle	132,322	PCS
22.	Carton-YOMA-640ml-Bottle	16,635	PCS
23.	Carton-Carlsberg-640ml-Bottle	6,494	PCS
24.	Plain Can Tray for Export	151,515	PCS
25.	Multipack 2X2-Carlsberg 330ml	1,000	PCS
26.	Multipack 2X2-Tuborg 330ml	1,000	PCS
27.	Multipack 2X2-YOMA Premium 500ml	1,000	PCS
28.	Multipack 2X2-YOMA Special 500ml	1,000	PCS
29.	Multipack Carton-YOMA Premium	1,000	PCS
30.	Multipack Carton-YOMA Special	1,000	PCS
31.	Multipack Carton-Carlsberg	1,000	PCS
32.	Multipack Carton-Tuborg	1,000	PCS
33.	Carton640ml-YOMA Special Brew-Ice Blast	51,755	PCS
34.	Dust Protector	160,000	PCS
35.	Tray-Tuborg-Can-330ml	13,573	PCS
36.	Tray-YOMAPremiumBrew-Can-330ml	73,770	PCS
37.	Tray-Carlsberg-Can-330ml	4,483	PCS
38.	Tray-YOMAPremiumBrew-500ml	67,945	PCS
39.	Tray-YOMASpecialBrew-330ml	610,765	PCS
40.	Tray-YOMASpecialBrew-500ml	1,633,033	PCS
41.	Tray-Cans-YOMAEExtra Strong 8% 500ml	296,441	PCS
42.	Tray-Tuborg-Green-Can-500ml	23,188	PCS
43.	Tray-Cans-BlackStout-500ml	26,665	PCS
44.	Tray-Cans-BlackStout-330ml	47,615	PCS
45.	TRAY-CAN-Tuborg Classic 330ml	41,414	PCS
46.	Tray-Tuborg-Classic-Can-500ml	36,277	PCS
47.	TRAY-CAN-YOMA Extra Strong 330ml	9,160	PCS
48.	Empty Bottle-Carlsberg-330ml-Old-NyDawn	3,283	Bottle
49.	Empty Bottles-Tuborg-640ml-Bottle-Old	466,108	Bottle
50.	Empty Bottles-YOMA-640ml-Bottle-Old	2,000	Bottle
51.	Empty Bottle-Carlsberg-640ml-Old	2,000	Bottle
52.	Empty Bottles-Carlsberg-640ml-Bottle-Crate	7	Bottle
53.	Empty Bottle-Carlsberg-640ml-Old-NyDawn	7	Bottle

No.	Item	Quantity	Unit per year
54.	Empty Bottles-Tuborg-640ml-Bottle-New	2,567,566	Bottle
55.	Empty Bottles-Carlsberg-640ml-Bottle-New-NyDawn	7	Bottle
56.	Hot Melt Glue	11,973	kg
57.	Glue	2,500	kg
58.	Label Neck-Carlsberg-330ml-Bottle	200,000	PCS
59.	Label Neck-Tuborg-640ml-Bottle	2,100,000	PCS
60.	Labels Body-Tuborg-640ml-Bottle	1,036,000	PCS
61.	Labels Back-Tuborg-640ml-Bottle	200,000	PCS
62.	Label Neck-YOMA-640ml-Bottle	200,000	PCS
63.	Labels Body-YOMA-640ml-Bottle	200,000	PCS
64.	Labels Back-YOMA-640ml-Bottle	200,000	PCS
65.	Label Body-Carlsberg-640ml-Bottle	200,000	PCS
66.	Label Back-Carlsberg-640ml-Bottle	200,000	PCS
67.	Label Neck-Carlsberg-640ml-Bottle	200,000	PCS
68.	Label Neck-YOMASpecialBrew-Ice Blast	200,000	PCS
69.	Label Body-YOMASpecialBrew-Ice Blast	200,000	PCS
70.	Label Back-YOMASpecialBrew-Ice Blast	1,000,000	PCS
71.	Crown Cork- Carlsberg	200,000	PCS
72.	Crown Corks-YOMA	395,801	PCS
73.	CrownCaps-YOMA Special Brew-Ice Blast	1,000,000	PCS
74.	Crown Corks-Tuborg	3,800,000	PCS
75.	Crown Corks-Tuborg-UTC-Promo	1,872,037	PCS
76.	Ink Make up (Domino)	30	Bottle
77.	Ink Carriage (Domino)	2	Bottle
78.	Ink Wash Solution (Domino)	2	Bottle
79.	Ink Reservoir (Domino)	2	Bottle
80.	Makeup Ink TH-Type B (Hitachi)	2	Bottle
81.	Black Ink JP-K26 (Hitachi)	2	Bottle
82.	MEK Cleaning Solution (Hitachi)	2	Bottle
83.	Black ink T551 (Linux)	24	Bottle
84.	Solvent	76	Bottle
85.	Cleaner CL1000 (Linux)	8	Bottle
86.	Ink Cartridge_Hitachi	8	Bottle
87.	Black Wet Process Ink, Catridge	14	Bottle
88.	Solvent, Catridge	62	Bottle
89.	Carton Tape	1	Roll
90.	KEGS-Seal Carlsberg	130,000	PCS
91.	KEGS-Seal Tuborg	120,000	PCS

No.	Item	Quantity	Unit per year
92.	KEGS-Seal YOMA	50,000	PCS
93.	KEGS-Seal BlackStout	20,000	PCS
94.	Shrink Film for Tray	8	Kg
95.	Shrink Film (540mm)	76,812	Kg
96.	Shrink Film (575mm)	79,866	Kg
97.	Broken Rice	4,445,823	Kg
98.	95% Alcohol	35	Drum
99.	KMS	400	Kg
100.	Phosphoric Acid (F/G)	15,000	Liter
101.	Citric Acid	3,000	Kg
102.	Calcium Chloride	4,000	Kg
103.	Calcium Sulphate	1,005	Kg
104.	Zinc Sulphate (ZnSO4.7H2O)	40	Kg
105.	Ferric Chloride	1	Kg
106.	NiCl 2	7	Kg
107.	ZnCl 2	7	Kg
108.	Real IBC	1,800	Liter
109.	Caustic Food Grade 99%	108,000	Kg
110.	Flake Caustic	500	Kg
111.	Nitric Acid 1 Box= 35 KG	530	Liter
112.	BAC STOP	60	Liter
113.	OXODES (HCL9%)	12,575	Liter
114.	OXONET (Sodium Chlorite 7.5)	12,575	Liter
115.	Stabilon WT	2,400	Liter
116.	Horolith FL	12,000	Liter
117.	Oxonia-150	2,400	Liter
118.	Topax 66	175	Liter
119.	Nalco 7320	816	Liter
120.	Nalco 7330	360	Liter
121.	Whisper V	250	Liter
122.	Nalco 3DT222	600	Liter
123.	Nalco ST70	240	Liter
124.	N780	94	Liter
125.	PC33	50	Liter
126.	PC67	50	Liter
127.	PC77	50	Liter
128.	PC11	50	Liter
129.	Topax 75	25	Liter

No.	Item	Quantity	Unit per year
130.	Termamyl-SCDS	1,800	Kg
131.	Ultraflow Max	500	Kg
132.	Attenuzyme	4,800	Kg
133.	Brewer's Clarex	500	Kg
134.	Caramel Color	7,634	Kg
135.	Aroma hops 4%	2,000	Kg
136.	Aroma Hop Pellets (7%)	2,585	Alpha-kg
137.	Bitter Hop CO2 Extract 51%	7	Alpha-kg
138.	Hop Extract Ike 1 kg Alpha	11	Alpha-kg
139.	Singha Hops 2	1	Alpha-kg
140.	Hop Extract Ike 1 kg Alpha	1,000	Alpha-kg
141.	Bitter Hop pellets 15% a-acid	7	Alpha-kg
142.	Bitter Hop pellets 15% a-acid	1,000	Alpha-kg
143.	Aroma hops for CB	1,050	ML
144.	Isohop Crop	8	Liter
145.	Malt Chinese	2,814,303	Kg
146.	Black Malt	12,000	Kg
147.	Sodium Meta Bi Sulphate	8	Kg
148.	Sodium Hexa Meta Phosphate	8	Kg
149.	Yeast Life Extra	2,000	Kg
150.	Fermaid-B	200	Kg
151.	PVPP	200	Kg
152.	PVPP Stabiclear	200	Kg
153.	Stabiquick W	200	Kg
154.	Sugar	40,000	Kg

3.3. EQUIPMENT LISTS

All the machines which are used in brewery production process including packaging machines are imported from overseas by the year 2013. The lists of machineries and the area where they installed in operation process of the factory are shown in the following Table 3-2.

Table 3-2 Imported Machinery List

No.	Machine Name	Area	Manufacturer
1.	Malt Milling	Raw Material Handling	BUHLER
2.	Rice Milling	Raw Material Handling	BUHLER
3.	Rice Cooker	Brewing	ZIEMANN
4.	Mash Tun	Brewing	ZIEMANN
5.	Mash Filter	Brewing	ZIEMANN

No.	Machine Name	Area	Manufacturer
6.	Wort Kettle	Brewing	ZIEMANN
7.	Whirlpool	Brewing	ZIEMANN
8.	Fermenter	Processing	ZIEMANN
9.	Membrane Filtration	Processing	PANTAIR
10.	Bright Brewery Tank	Processing	ZIEMANN
11.	Canning Line	Packaging	KHS
12.	Bottling Line	Packaging	KHS
13.	Kegging Line	Packaging	KHS

3.4. EMPLOYMENT

Generally, the production department is operated for 24 hours with three shifts. It is required three teams for full coverage and there are altogether 8 workers in each team. On the other hand, working hours for office staff is from 8:00 am to 5:00 pm from Monday to Friday and 8:00 am to 12:00 pm on Saturdays. The break time is 12:00 pm to 1:00 pm. Sunday and other gazette holidays are closed. Total of 75 employees are employed in the factory. The detail list of employees is shown in Table 3-3.

Table 3-3 List of Employees

No.	Employee Name	Designation	Section
1.	Tun Tun Win 1	Assistant Manager, Brewing	Brewing & Processing
2.	Si Thura	Executive, Brewing	Brewing & Processing
3.	Aung Ko Min	Executive, Brewing	Brewing & Processing
4.	Myo Myint Thein	Brewing Technician	Brewing & Processing
5.	Naing Toe Wai	Brewing Technician	Brewing & Processing
6.	Htet Zay Shin	Brewing Technician	Brewing & Processing
7.	Than Htike Aung	Brewing Technician	Brewing & Processing
8.	Min Thant Ko	Brewing Technician	Brewing & Processing
9.	Hlaine Htet Aung	Brewing Technician	Brewing & Processing
10.	Aung Set Paing	Brewing Technician	Brewing & Processing
11.	Shwe Yee Tun Lin	Brewing Technician	Brewing & Processing
12.	Kyaw Oo Thar	Brewing Technician	Brewing & Processing
13.	Kyaw Soe Lwin	Engineering Technician	Engineering
14.	Zaw Phyto Shein	Engineering Technician	Engineering
15.	Than Aung	Engineering Technician	Engineering
16.	Zaw Nyunt Oo	Engineering Technician	Engineering
17.	Soe Lwin Htoo	Engineering Technician	Engineering
18.	Aerry Lwin	Engineering Technician	Engineering

No.	Employee Name	Designation	Section
19.	Thazin Tun	Executive, Engineering Store	Engineering
20.	Zaw Naing Oo	Manager, Maintenance & Utility	Engineering
21.	Zay Yar Lin	Engineering Technician	Engineering
22.	Tin Tun Naing	Engineering Technician	Engineering
23.	Zaw Min Tun	Executive, Engineering	Engineering
24.	Yan Naing Htun	Engineering Technician	Engineering
25.	Myint Khaing	Engineering Technician	Engineering
26.	Lwin Moe Oo	Engineering Technician	Engineering
27.	Kyaw Soe Win	Engineering Technician	Engineering
28.	Saw Eh Dee Khu	Engineering Technician	Engineering
29.	Tun Tun Win 2	Engineering Technician	Engineering
30.	Ye Min Ko	Engineering Technician	Engineering
31.	Ye Min	Engineering Technician	Engineering
32.	Si Thu Ye	Engineering Technician	Engineering
33.	Soe Moe Naing	Engineering Technician	Engineering
34.	Saw Win Kyi	Engineering Technician	Engineering
35.	Myo Min Htun	Engineering Technician	Engineering
36.	Aung Bo Win	Executive, Automation	Engineering
37.	Aung Khine Sint	Engineering Technician	Engineering
38.	Zay Yan Min Naing	Engineering Technician	Engineering
39.	Aung Thu Yein	Assistant Manager, Safety & Health	Health, Safety & Environment (HSE)
40.	Thein Zaw Oo	Manager, Packaging	Packaging
41.	Phyo Mg Mg Soe	Executive, Packaging	Packaging
42.	Min Aung	Executive, Packaging	Packaging
43.	Kyaw Kyaw Lwin	Packaging Technician	Packaging
44.	Soe Kyaw Thu	Packaging Technician	Packaging
45.	Aung Thu	Executive, Packaging	Packaging
46.	Naing Tun	Assistant Manager, Packaging	Packaging
47.	Win Than Htun	Packaging Technician	Packaging
48.	Zaw Zaw Aung	Packaging Technician	Packaging
49.	Kyaw Swar Min	Packaging Technician	Packaging
50.	Win Tun	Packaging Technician	Packaging

No.	Employee Name	Designation	Section
51.	Aung Phyo Kyaw	Packaging Technician	Packaging
52.	Aung Myint Myat	Packaging Technician	Packaging
53.	Aung Kyaw Soe	Executive, Packaging & Lean TPM	Packaging
54.	Kyaw Zin Hein	Packaging Technician	Packaging
55.	Arkar Soe	Packaging Technician	Packaging
56.	Pyae Phyo Aung	Packaging Technician	Packaging
57.	Yar Zar Naing	Packaging Technician	Packaging
58.	Thura Htet Ko	Packaging Technician	Packaging
59.	Han Ko Oo	Packaging Technician	Packaging
60.	Kyaw Thu Lin	Packaging Technician	Packaging
61.	Min Thu Kyaw	Packaging Technician	Packaging
62.	Kyaw Thura Win	Senior Executive, QA	Quality Assurance
63.	Aung Myo Thant-2	Executive, QA	Quality Assurance
64.	Aung Myo Thu	QA Technician	Quality Assurance
65.	Chit Ko Ko Zaw	QA Technician	Quality Assurance
66.	Thae Ei Tun	QA Technician	Quality Assurance
67.	Saw Marlar	Manager, QA	Quality Assurance
68.	Maw Soe	QA Technician	Quality Assurance
69.	Nyi Zar Soe	QA Technician	Quality Assurance
70.	Thwal Zin Tun	Executive, QA	Quality Assurance
71.	Htein Linn Aung	QA Technician	Quality Assurance
72.	Ei Mon Kyaw	QA Technician	Quality Assurance
73.	Aung Myo Kyaw	QA Technician	Quality Assurance
74.	Than Zaw	Senior Manager, Brewery	Supply Chain
75.	Wai Yan Aung	Management Associate, Supply Chain	Supply Chain

3.5. TYPE OF PRODUCTS

Four brands are manufactured at the brewery factory. They are Carlsberg, Tuborg, Black Eagle and YOMA. Each brand has different type of brewery, packaging type and size. Currently, there are altogether 36 number of products. The specification of each brewery type is shown in Table 3-4.

Table 3-4 Type of Products

No	Brand	Type of Brewery	Packaging Type	Package size
1.	Carlsberg	Lager Brewery (ALC 5.0 % Vol)	Glass Bottle	330 ml
2.	Carlsberg	Lager Brewery (5.0 % ABV)	Keg	10 Liter
3.	Carlsberg	Lager Brewery (5.0 % ABV)	Keg	20 Liter
4.	Carlsberg	Lager Brewery (5.0 % ABV)	Keg	30 Liter
5.	Carlsberg	Lager Brewery (Alca 5.0 % Vol)	Can	330 ml
6.	Carlsberg	Lager Brewery (ALC 5.0 % Vol)	Glass Bottle	640 ml
7.	Tuborg	Premium Brewery (Alca 5.0 % Vol)	Can	330 ml
8.	Tuborg	Premium Brewery (ALC 5.0 % Vol)	Glass Bottle	640 ml
9.	Tuborg	Lager Brewery (5.0 % ABV)	Keg	10 Liter
10.	Tuborg	Lager Brewery (5.0 % ABV)	Keg	20 Liter
11.	Tuborg	Lager Brewery (5.0 % ABV)	Keg	30 Liter
12.	Tuborg	Premium Brewery (Alca 5.0 % Vol)	Can	500 ml
13.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Can	330 ml
14.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Can	500 ml
15.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Glass Bottle	640 ml
16.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Keg	10 Liter
17.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Keg	20 Liter
18.	Tuborg	Strong Brewery (Alca 6.1% Vol)	Keg	30 Liter
19.	BLACK EAGLE	Stout Brewery (Alca 8.8% Vol)	Can	330 ml
20.	BLACK EAGLE	Stout Brewery (Alca 8.8% Vol)	Can	500 ml
21.	BLACK EAGLE	Stout Brewery (8.8% Alcohol)	Keg	10 L
22.	BLACK EAGLE	Stout Brewery (8.8% Alcohol)	Keg	20 L
23.	BLACK EAGLE	Stout Brewery (8.8% Alcohol)	Keg	30 L
24.	YOMA	Lager Classic Brewery (Alca 5.0 % Vol)	Can	330 ml
25.	YOMA	Lager Classic Brewery (Alca 5.0 % Vol)	Can	500 ml
26.	YOMA	Lager Classic Brewery (Alca 5.0 % Vol)	Glass Bottle	640 ml
27.	YOMA	Premium Brewery (Alca 5%)	Keg	10 Liter
28.	YOMA	Premium Brewery (Alca 5%)	Keg	20 Liter
29.	YOMA	Premium Brewery (Alca 5%)	Keg	30 Liter
30.	YOMA	Lager Special Brewery (Alca 6.5% Vol)	Can	330 ml
31.	YOMA	Lager Special Brewery (Alca 6.5% Vol)	Can	500 ml
32.	YOMA	Special Brew Lager Brewery (Alca 6.5 %)	Glass Bottle	640 ml
33.	YOMA	Special Brew (Alca 6.5 %)	Keg	10 Liter
34.	YOMA	Special Brew (Alca 6.5 %)	Keg	20 Liter

No	Brand	Type of Brewery	Packaging Type	Package size
35.	YOMA	Special Brew (Alca 6.5 %)	Keg	30 Liter
36.	YOMA	Lager Strong Brewery (Alca 8% Vol)	Can	500 ml

3.6. PRODUCTION RATE

The final products are distributed to all over Myanmar. The average daily production rate of brewery kegs, bottles and cans are 1,560 kegs/d, 528,000 bottle/d and 720,000 cans/d respectively. The estimated annual brewery production rate is 569,400 kegs, 192,720,000 bottles and 262,800,000 cans.

3.7. PRODUCTION PROCESS

Brewing is the process of production of malt beverages. Breweries, ale and lagers are the main malt beverages produced by a method called brewing. Brewing is a complex fermentation process. It differs from other industrial fermentation because flavor, aroma, clarity, color, foam production, foam stability and percentage of alcohol are the factors associated with finished product. Flow chart of brewery production process is shown in Figure 3-3.

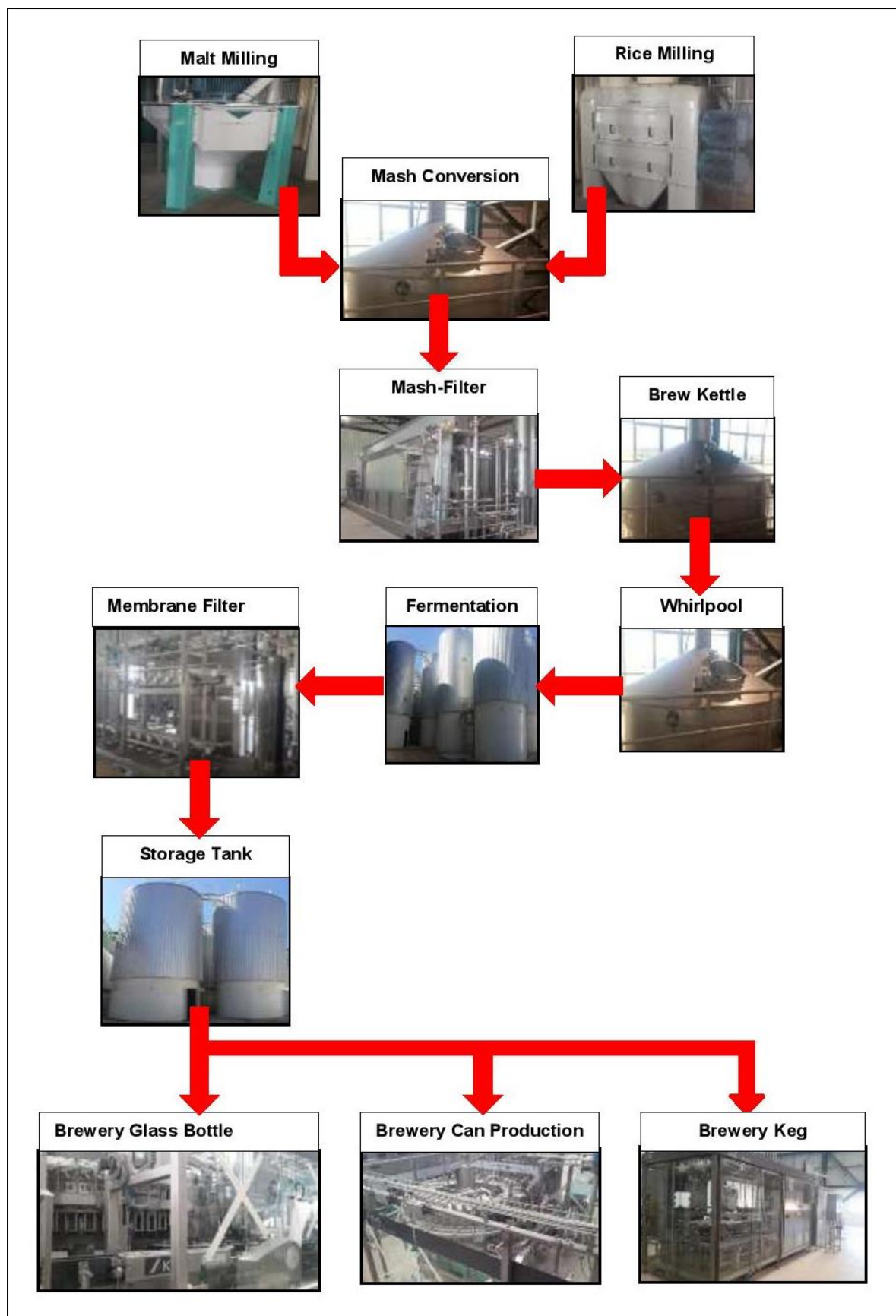


Figure 3-3 Brewery Production Process

3.7.1. Malt and Rice Milling

At the beginning of the Brewing, Malt and rice are crushed separately to break up the grain kernels in order to extract fermentable sugars to produce a milled product called grist. Then, grist is collected into the grist case and ready for next stage. The diagram of milling machine and smashed malt and rice collection is shown in Figure 3-4.



Milling Machine



Collecting of Smashed Malt and Rice

Figure 3-4 Malt and Rice Milling Process

3.7.2. Mash Conversion

The grist is then transferred into a mash tun, where it is mixed with heated water in a process called mash conversion. The conversion process uses natural enzymes in the malt to break the malt's starch down into fermentable sugars. This process produces the sweet liquid known as wort in which the fermentable sugar is dissolved. The process of mash conversion is shown in Figure 3-5.



Figure 3-5 Mash Conversion Process

3.7.3. Filtration

The mash is then passing through the filtration process, where wort is separated from the spent grains and spent hops. It is also collected the fermentable liquid from retained grain as much as possible. Then, these grains are reused for animal farmland. The combined Lautering and Brewing chamber is shown in Figure 3-6.



Figure 3-6 Mash Filter

3.7.4. Brew Kettle

The wort collected from previous process is transferred to a brew kettle and boiled to sterilize and concentrate it. Hops in the forms of pellets or liquid extract are added at various times during the boiling period. Photo of boiling tank also known as brew kettle is shown in Figure 3-7.



Figure 3-7 Brew Kettle

3.7.5. Wort Separation

After boiling, the wort is transferred into a whirlpool from brew kettle for the wort separation stage. During this stage, any malt or hop particles are removed to leave a liquid that is ready to be cooled. The wort separation tank is shown in Figure 3-8.



Figure 3-8 Wort Separation Tank

3.7.6. Fermentation

To start the fermentation, yeast is added during the filling of the vessel after cooling stage. Yeast converts the sugary wort into brewery by producing alcohol. At the end of fermentation, suspended solids are removed from the brewery either settling or by

centrifugation. The spent yeast is collected in a tank for transport away and used for agricultural purpose. After fermentation, the young “green” brewery needs to be matured in order to allow both a full development of flavors and a smooth finish. Fermentation tank is shown in Figure 3-9.



Figure 3-9 Fermentation Process

3.7.7. Membrane Filtration System

Membrane filter is used as the final filtration stage in brewery production process. Any substances still remaining after fermentation and maturation process are extracted and the brewery gets its final condition. The membrane filtration system is shown in Figure 3-10.



Figure 3-10 Membrane Filtration System

3.7.8. Storage Tank

In this stage, matured brewery from membrane filtration process is filled into the storage tank. The photo of brewery storage tank is shown in Figure 3-11.



Figure 3-11 Brewery Storage Tank

3.7.9. Packaging

The final stage in the brewing process is the packaging. In which, brewery bottles, cans and keg are sterilized first before filling with brewery in the filling station. There are two main steps in the packaging process. The first one is the bottling process in which the bottles and cans are pressurized with CO₂ to prevent making excessive foam when the brewery is forced into the bottles under pressure. The brewery is filled using counter pressure to prevent any carbon dioxide from escaping. After filling, the pressure is relieved very slowly till it is reached at ambient pressure. For kegging process, filtered brewery from membrane filter is pasteurized first. After that, the pasteurized brewery is filled into the kegs. The photo of packaging process for brewery bottles, cans and kegs are shown in Figure 3-12 to Figure 3-14.



Figure 3-12 Bottle Production Process



Figure 3-13 Can Production Process



Figure 3-14 Keg Process

3.7.10. Water and Solid Balancing of Brewery Production Process

Regarding consumption of good-quality water in brewerybrewing, more than 90% of brewery is water and an efficient brewery will use between 4–7 liters (L) of water to produce 1L of brewery. Water is also lost through with spent grains account to 10 % while 70 % turns to steam in boiling process.

When it comes to industrial process wastewater, the pollutant load of brewery effluent is primarily composed of organic material from process activities. Brewery processes also generate liquids such as the weak wort and residual brewery which the brewery should reuse rather than allowing entering the effluent stream. The main sources of residual brewery include process tanks, diatomaceous earth filters, pipes, brewery rejected in the packaging area, returned brewery, and broken bottles in the packaging area. Waste balance diagram of brewery production process is shown in Figure 3-15.

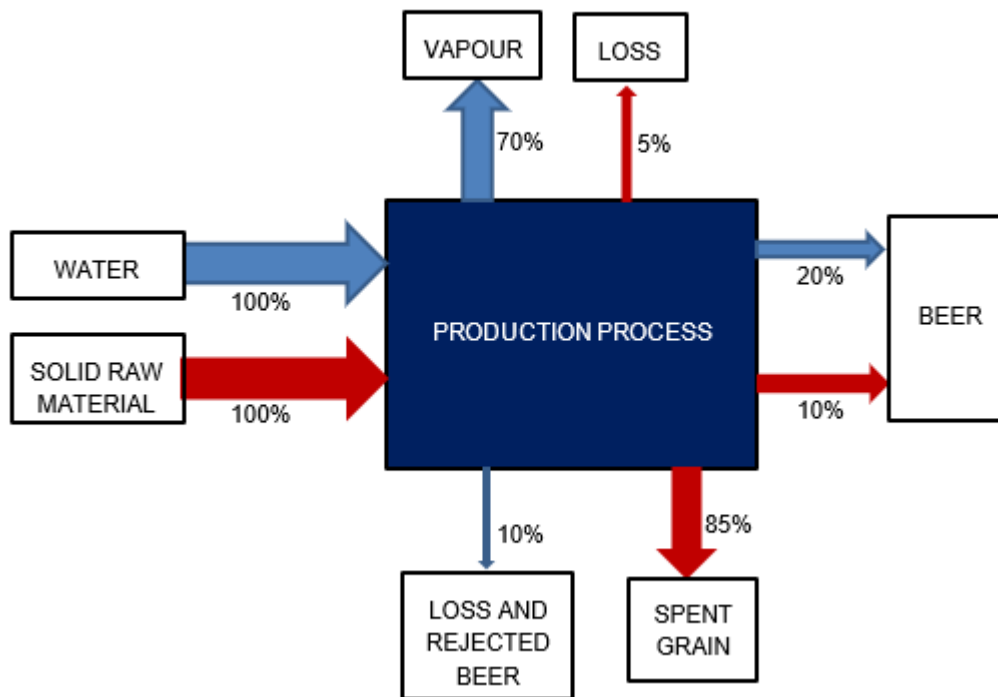


Figure 3-15 Water and Solid Balance Diagram of Brewery Production

3.8. SUPPORT FACILITIES FOR WORKERS

There are three main types of supporting facilities for workers within the factory. They are clinic, drinking water supply and canteen.

3.8.1. Factory Clinic

A clinic is provided for healthcare of workers with well stocked of necessary registered medicines. 9 employees attended the one-day training program organized by Myanmar Red Cross Society for minor injuries, sickness and emergency medical care. The training certificate of the first aid leaders are expressed in **APPENDIX D**. Other serious injuries cases are arranged to transfer Bago General Hospital. Factory clinic is shown in Figure 3-16. Moreover, it is also provided the list of 9 first aider who are trained by “Myanmar Red Cross Society” organization is shown in Table 3-5.



Figure 3-16 Factory Clinic

Table 3-5 First Aider List

No.	Name	Department	Telephone No.
1.	Myo Thwe Hnin	Admin cum Nurse	09 772 917 596
2.	Aung Ko Min	Brew & Process	09 770 049 048
3.	Min Thant Ko	Brew & Process	09 977 813 994
4.	Soe Lwin Htoo	Engineering	09 400 531 359
5.	Zaw Nyunt Oo	Engineering	09 420 234 901
6.	Aung Thu	Packaging	09 973 831 693
7.	Phyo Mg Phyu Soe	Packaging	09 969 979 714
8.	Kaung Myat	Warehouse	09 969 979 722
9.	Mg Myatt	Warehouse	09 424 533 227

Source Myanmar Carlsberg Company Limited

3.8.2. First Aid Box

There are total of 15 first aid boxes provided at each department. The location of first aid boxes and its accessories are shown in Table 3-6 and Source Myanmar Carlsberg Company Limited

Table 3-7 respectively. Current condition and quality of first aid boxes are shown in Figure 3-17.

Table 3-6 List of First Aid Box

Department	Location	Quantity
Packaging	Near Labeller	1
	Near Keg Line	1
	Near Unpacker	1
Warehouse and Depot	Warehouse Office	1
	Depot Office	1
Engineering	CO ₂ Plant	1
	Workshop	1
	Boiler	1
	Water Treatment Plant	1
	Exchange Traded Product	1
Quality Assurance	Main Lab	1
	Packaging Lab	1
Brewing and Processing	Brew Office	1
Admin	First Aid Room	1
Office	Main Office	1
Total		15

Source Myanmar Carlsberg Company Limited

Table 3-7 Accessories of First Aid Boxes

No.	Item	Unit	Qty
1.	Roller Bandages 2"	pcs	2
2.	Roller Bandages 3"	pcs	2
3.	Handy Plats	pcs	5
4.	Betadine/Sept dine	tube	1
5.	Spirit	bottle	1
6.	Gauze Pad	pcs	5
7.	Cotton Wool	pack	1
8.	Adhesive Tape	roll	1
9.	Paper Tape	roll	1
10.	Triangular Bandage	pcs	1
11.	Nitrile Glove	pcs	5
12.	Scissors	pcs	1
13.	Forceps	pcs	1
14.	Elastic Bandage	pcs	2
15.	Sufre	pcs	1
16.	Apron	pcs	1

Source Myanmar Carlsberg Company Limited



Figure 3-17 Provision of First Aid Box

3.8.3. Canteen

For employees, there are facilities such as canteen to have their lunch in the factory compound. Daily drinking water demand of the factory is around 150 liters (L). 20 L plastic drinking water bottles are provided for drinking purpose. Photos of canteens and drinking water bottles are shown in Figure 3-18 and Figure 3-19.



Figure 3-18 Factory's Canteen



Figure 3-19 Purified Drinking Water Bottles

3.8.4. Sanitary

Regarding sanitation, there are 14 male toilets and 11 female toilets provided for workers. The sewage from the toilets are treated by septic tanks before going to the sewer pipe line in the factory compound. Generally, the sludge from the septic tank has been removed every two year. Current condition of sanitary facilities and the list of the toilets in factory are shown in Figure 3-20 and Table 3-8.



Figure 3-20 Current Condition of Sanitary Facilities

Table 3-8 Factory Toilet List

No	Department	Toilet		Basin		Bath Room	
		Male	Female	Male	Female	Male	Female
1.	Canteen	4	3	3	2	3	1
2.	Packaging	5	3	2	3		1
3.	Brewing	2	2	3	3	1	
4.	Main Office	3	3	3	3		1
Total		14	11	11	11	4	3

Source Myanmar Carlsberg Company Limited

3.8.5. Other Facilities

It is also providing several types of facilities for the employees. The employees are allowed medical leaves when they suffer from personal health diseases. Based on the performance and the yearly profit of the company, the annual bonus will be announced and paid to each employee every year. Regarding transportation, there are three ferries provided for employees. The photo of the buses provided for transportation are shown in Figure 3-21.



Figure 3-21 Ferries Provided for Employees

Besides, Myanmar Carlsberg also provide not only uniform for all employees but also the personal protective equipment (PPE) especially for the worker from brewery production sector. The photos of provided PPE by factory are shown in in Figure 3-21.



Figure 3-22 Provided PPE by Factory

3.9. PROJECT UTILITIES

The main utilities for Myanmar Carlsberg are water supply, water treatment plant, transformers, generators, boiler, waste-water treatment plant and drainage channels.

3.9.1. Water Supply

Water is pumped from the 5 tube wells of 8 inches diameter and stored at different water storage tank for various purposes. There are altogether 9 water storage tanks and the capacity of those tanks are shown in Table 3-9. The estimated amount of water consumption is about 5,000 Liters (L) per day with monthly water consumption of 150,000 L for the whole factory. The annual water consumption of the factory is estimated to be approximately 1,740,000 L. Current condition of tube well and depth of each tube well are described in Figure 3-23 and Table 3-10.



Figure 3-23 Tube Well

Table 3-9 Water Storage Tanks

No.	Type	Numbers	Diameter (m)	Height (mm)	Capacity (m³)
Water Treatment Plant					
1.	Raw Water Tank	1	2000	4500	14
2.	Service Water Tank	1	4500	13000	200
3.	Process Water Tank	1	5600	12000	300
4.	Boiler Water Tank	1	2500	5000	25
Brewing & Processing					
1.	Cold Water Tank	1	3000	9000	65
2.	Brew Water Tank	1	3000	9000	65
3.	Hot Water Tank	1	3800	3900	108
4.	Cooling Water Tank	1	2500	6500	32.8
Fire Fighting					
1.	Firefighting water tank	1	5600	14100	350

Source Myanmar Carlsberg Company Limited

Table 3-10 Tube Well

No.	Tube Well	Diameter (inches)	Depth
1.	No.1	8 in	480 ft
2.	No.2	8 in	520 ft
3.	No.3	8 in	520 ft
4.	No.4	8 in	540 ft
5.	No.5	8 in	540 ft

Source Myanmar Carlsberg Company Limited

3.9.2. Electricity

3.9.2.1. Transformer

Electricity used for operation process is provided from industrial zone grid line of the Bago Township with two transformers and a photo of transformer is shown in Figure 3-24. Moreover, the monthly electricity consumption of the factory for the year 2019 and 2020 from January to July are described in Table 3-11.



Figure 3-24 11 kVA Transformer

Table 3-11 Monthly Electricity Consumption of Factory

Year	Electricity Consumption, kWh						Annual
2019	Jan	Feb	Mar	Apr	May	Jun	28,984,868
	399,647	759,710	1,122,731	1,500,012	1,880,825	2,266,981	
	July	Aug	Sep	Oct	Nov	Dec	
	2,613,066	2,998,236	3,367,153	3,739,975	3,976,722	4,359,812	
2020	Jan	Feb	Mar	Apr	May	Jun	8,671,883
	380,698	684,330	1,005,381	1,156,669	1,437,324	1,805,223	
	July	Aug	Sep	Oct	Nov	Dec	
	2,202,259	-	-	-	-	-	

Source Myanmar Carlsberg Company Limited

3.9.2.2. Generator

In case of emergency, it is also essential to use generator. There are two generators with the capacity of 1,010 KVA and 500 KVA which are used only in case of electricity breaks down. Monthly diesel consumption of the generator is approximately 3,000 L. The photo of generators is shown in Figure 3-25.



Figure 3-25 Generator

3.9.3. Fuel Storage Tank

The fuel is mainly used for vehicles. There are two types of fuel storage tanks, namely, gasoline storage tank and diesel storage tank with the capacity of 25 kiloliters (kL) and 50 kL respectively. Monthly diesel consumption of the whole factory is approximately 73 kL. The photos of fuel storage tanks are shown in Figure 3-26.



Figure 3-26 Fuel Storage Tank

3.9.4. Boiler

The centralized steam boiler, shown in Figure 3-27 is used to fulfill factory requirement. The boiler can generate steam 12,000 kg/hour. Daily raw water requirement of the boiler is around 6 m³/d. Current fuel usages for the centralized steam boiler is diesel. It is also planned to apply biogas from wastewater treatment plant, as a source of fuel in the future. Monthly diesel consumption of the boiler is approximately 69,600 L. The detail information of steam boiler is shown in Table 3-12.

Table 3-12 Boiler Specification

Manufacture	THERMAX LIMITED (INDIA)
Capacity	12 TPH
Model	SM 120DH/10.54/1007
Design PR.	10.54 kg/cm2
Evaporation	12000 kg/hr. F&A 100 °C
Output	7.334 MW
Burner Manufacture	Oilton
Type	GKT-12S (Dual Burner)
Manu No.	11579
Manuf. Year	2014
Fuel	LDO/BIOGAS (Current Use - Diesel)
Working Pressure	9 Bar-g
Safety Valve set pressure	10.54 Bar-g

Source Myanmar Carlsberg Company Limited



Figure 3-27 Centralized Steam Boiler

3.9.5. Wastewater Treatment Plant

Both of domestic wastewater from employees' facilities and wastewater from brewery production process is transferred to sewage and industrial waste pipe lines separately. Then, wastewater is treated at Wastewater Treatment Plant (WWTP) that is a sequential process of treating contaminants in wastewater. The capacity of WWTP is 1,000 m³/d. The flow diagram of wastewater treatment system is described in Figure 3-28. Photos of current wastewater treatment plant conditions are shown in Figure 3-29. The detail procedure of wastewater treatment process of the factory is as follows.

a) Coarse Screen Chamber

First of all, coarse screen is installed to remove floating matter from wastewater of the factory.

b) Collection Sump

After passing through the coarse screen, effluent water from the coarse screen chamber is collected in the collection tank first.

c) Dutch State Mines Screen

It is also essential for wastewater to passthrough the Dutch State Mines (DSM) screen. The function of DSM is to remove particles that may cause maintenance issues and operational problems of the treatment process. The size of fine screen typically ranges from 0.06 to 0.25 inches.

d) Equalization Tank

After the fine screen, wastewater comes into the equalization tank. The main function is to maintain the constant flow of incoming raw water that comes at widely fluctuating rates. It also adjusts the pH values by adding caustic soda (NaOH) and hydrochloric acid (HCl) depending on the influent pH concentration.

e) Primary-clarifier

After equalization tank followed by primary-clarifier. It is a circular tank in which wastewater is held for a period of time to allow heavier solids to settle to the bottom as sludge and lighter materials to float on the water surface as scum. The sludge from primary-clarifier is transferred to sludge tank while effluent water from this clarifier goes to buffer tank.

f) Buffer Tank

In this stage, nutrient is added into the wastewater to prepare the proper type of wastewater for aerobic and anaerobic treatment process. It is implemented to allow the further purification processes to run as effectively as possible.

g) Aerobic and anaerobic biological treatment process

Effluent wastewater from buffer tank is treated by biological treatment process including anaerobic reactor which produces biogas followed by aerobic reactor. Then, the biogas is collected in the biogas tank to use as a fuel sources for boiler. Some are gone to flare stack, used for burning off flammable gas released by safety valves during unplanned over-pressuring of plant equipment. At the same time, the sludge from anaerobic reactor is transferred to sludge tank while effluent water from the biological treatment process goes to the secondary clarifier.

h) Secondary Clarifier

Secondary clarifiers are used to remove the settable suspended solids created in biological treatment processes. From which, the activated sludge is transferred to sludge storage tank while effluent water from this clarifier goes to the treated water tank.

i) Treated Water Tank

Finally, effluent water from secondary clarifier is stored in the treated water tank before discharging into nearby waterbody while a certain amount of treated water is used for gardening purposes. The quality of effluent discharge shall meet the standard of National Environmental Quality Emission Guidelines (NEQEG).

j) Sludge Management System

The sludge and scum from the wastewater treatment process are collected in the sludge thickener. The thickened sludge from sludge thickener is collected into the sludge tank. Finally, sludge sump from the effluent collection sludge tank is dewatered by belt pressure before delivering for the solid waste landfill while some are also used for gardening.

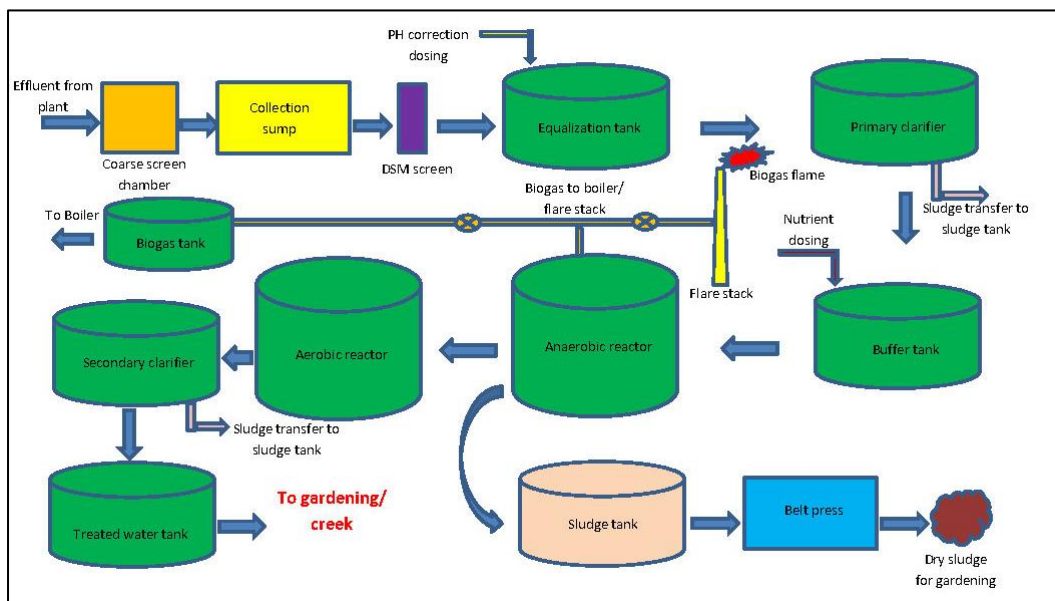
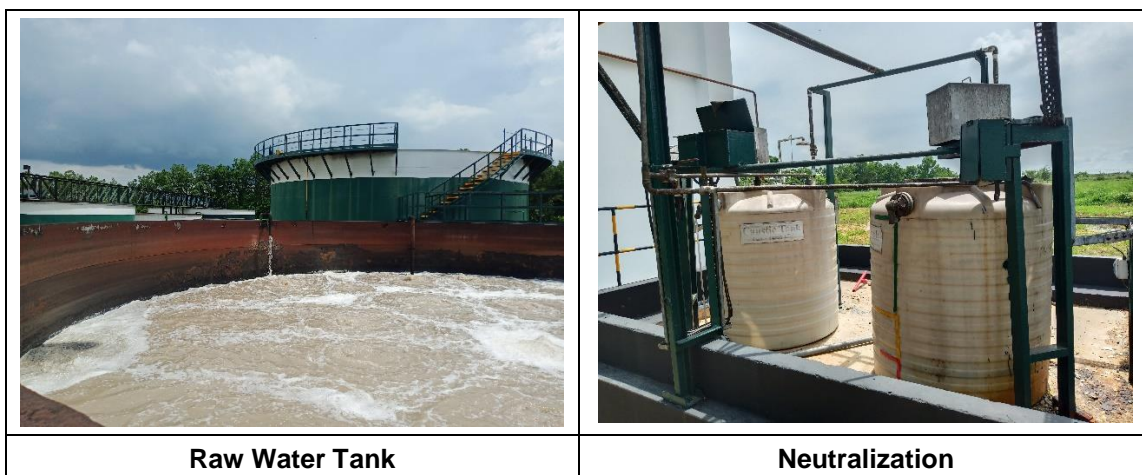


Figure 3-28 Wastewater Treatment Plant Flow Chart



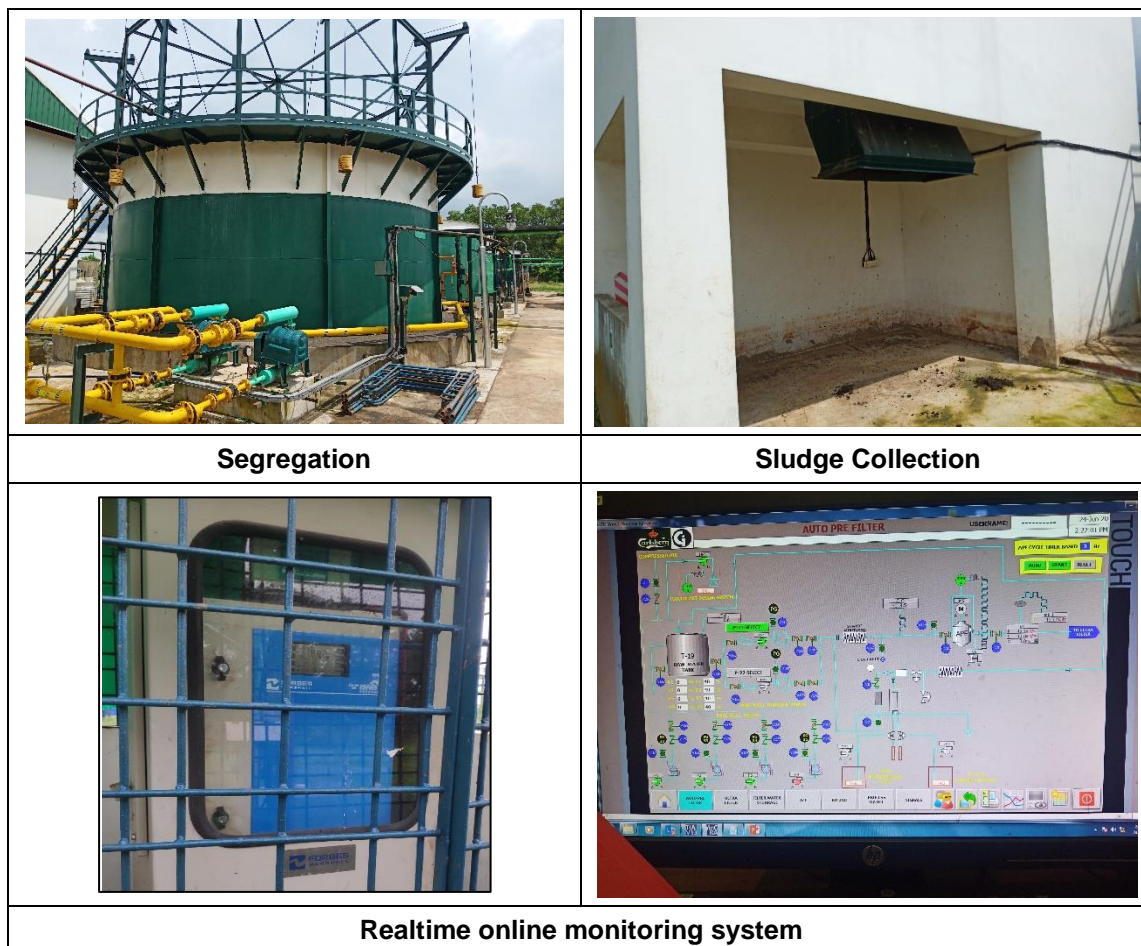


Figure 3-29 Wastewater Treatment Plant Conditions

3.9.6. Ventilation System

Ventilation system is provided for workers at operation places. Air-cons, windows, exhaust fans, filters and main doors are provided for workers in the factory. The current condition of factory's ventilation system is shown in Figure 3-30.

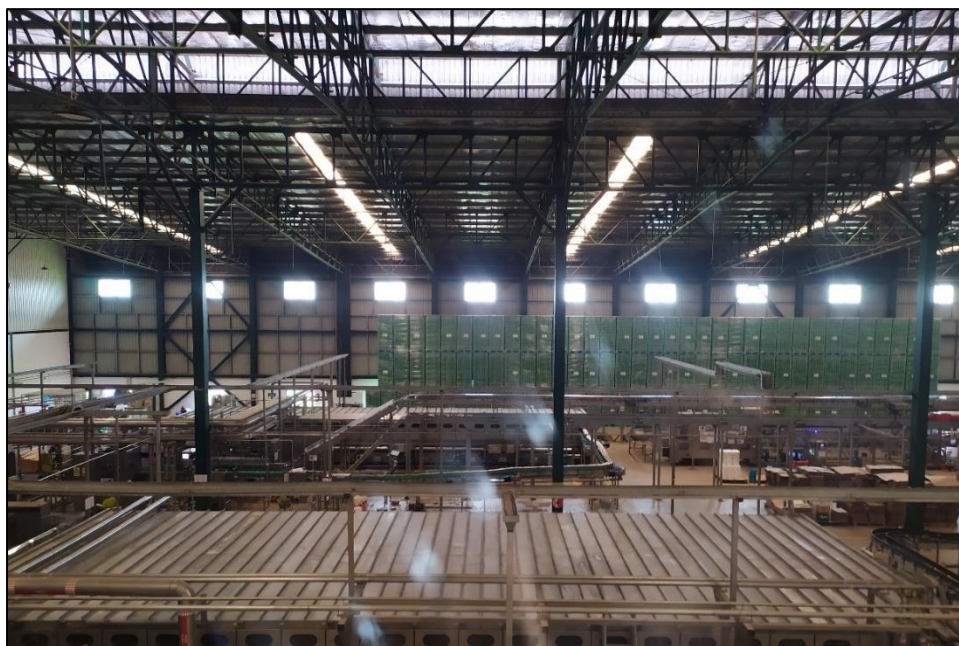


Figure 3-30 Current Condition of the Factory's Ventilation System

3.9.7. Firefighting System

The factory provided sufficient firefighting equipment around the factory to prevent fire in case of emergency. The number of firefighting equipment list and fire fighter list are described in Table 3-13 and Table 3-14. Firefighting equipment is shown in Figure 3-31 to Figure 3-34. Firefighting training certificate is expressed in **APPENDIX E**.

Table 3-13 List of Firefighting Equipment

No	Type of Equipment	Quantity
1.	ABC (2 kg)	5
2.	ABC (4 kg)	36
3.	ABC (6 kg)	37
4.	CO ₂ (4.5 kg)	20
5.	CO ₂ (5 kg)	3
6.	CO ₂ (22.5 kg)	9
7.	Foam (9 lit)	4

Source Myanmar Carlsberg Company Limited



Figure 3-31 Firefighting Equipment



Figure 3-32 Fire Extinguisher



Figure 3-33 Fire Engine



Figure 3-34 Fire Fighting Team

Table 3-14 Fire Fighter List

No.	NAME	Department	Telephone No.
1.	U Tin Tun Naing	Engineering	09 793463670
2.	U Aerry Lwin	Engineering	09 795892296
3.	U Soe Moe Naing	Engineering	09 797949676
4.	U Win Than Tun	Packaging	09 961259613
5.	U Ye Min	Packaging	09 768204461
6.	U Kyaw Zin Hein	Packaging	09 457883232
7.	U Than Aung	Brew & Process	09 970788113
8.	U Myo Myint Thein	Brew & Process	09 444521673
9.	U Kyaw Oo Thar	Brew & Process	09 696269880
10.	U Aung Myo Thant	QA	09 791234967
11.	U Aung Myo Kyaw	QA	09 770762244
12.	U Aung Myo Thu	QA	09 793463930
13.	U Hein Win Htet	Warehouse	09 969606578
14.	U Kyaw Zaya	Warehouse	09 450521603
15.	U Maung Maung	Warehouse	09 424533227
16.	U Htay Aung	Contractor	09 451515547
17.	U Myint Tun	Contractor	09 788588687
18.	U San Linn Aung	Contractor	09 787487641
19.	U Min Min	Security	09 797507674
20.	U Tin Thaug	Security	09 770922904
21.	U Hla Win	Security	09 780467266

Source Myanmar Carlsberg Company Limited

3.9.8. Drainage Channels

There are three types of drainage systems in Myanmar Carlsberg Brewery compound. They are -

- 1) Drainage for sewage and domestic wastewater from employees' facilities
- 2) Drainage for process wastewater
- 3) Drainage for rain water

All drainage systems are installed by pipes and each drainage line is connected separately. Factory has its own septic tanks for sewage storage. Then, wastewater outlet pipe lines from septic tanks are connected to the central sewage pipe network of factory wastewater treatment plant. All wastewater from brewery production process is also treated in wastewater treatment plant. The majority of effluent water from wastewater treatment plant is directly discharged into the nearby water body and it is also reused for the gardening. The effluent meets National Environmental Quality Emission Guidelines (NEQEG). Generally, rainwater from road and around the factory compound is flow to the nearest drainage channel. Details specification of a drainage system is described in Table 3-15.

Table 3-15 Details Specification of a Drainage System

No.	Description	Building AB	Building C	Building D	Building E	Total	Unit
1.1	PVC GRADE 13.5						
	DIA 200 mm	45	60	50	7	162	m
	DIA 150 mm	30	30	33		93	m
	DIA (5.4"x 4") Down Spout Pipe	223	355	325	75	978	M
	DIA 315 HDPE Pipe			20		20	M
1.2	PIPE FITTINGS					1	Lot
1.3	HANGER & SUPPORT					1	Lot
1.4	LABEL & PAINTING					1	Lot
1.5	RCP (FOR OUTSIDE DRAINAGE)						
	DIA 450 mm	273	260			533	M
1.6	MAN HOLE						

No.	Description	Building AB	Building C	Building D	Building E	Total	Unit
	FOR DIA 300 mm RCP Pipe		6	22		28	SET
	FOR DIA 450 mm RCP Pipe	27	19			46	SET
	FOR DOWN SPOUT PIPE	4	27	21	1	53	SET

Source Myanmar Carlsberg Company Limited

3.10. AMOUNT AND TYPES OF WASTE

3.10.1. Solid Waste

There are 5 main departments' warehouse, packaging, brewing & processing, quality assurance and engineering department. The amount of waste produced and type of waste is varied depend on the process. The produced wastes are divided into 5 types and treated separately. Estimation of monthly produced waste and annual chemical consumption of the factory are shown in Table 3-16 and Table 3-17. They are hazardous waste, recycle waste (to be sold), glass breakage, supplier waste (directly collected), general waste (bio-degradable/ non-bio degradable).

Normally, brewery production and engineering departments are the main sources of hazardous waste generation. The most common types of hazardous waste from those departments are sludge of caustic recovery tank, chemical drums, used batteries and oil.

(a) Warehouse Department

Warehouse department mainly generated recycle waste (used can, empty carton, wooden pallet, paper layer pad, empty rice and malt bag, and chemical drums), broken glasses, hazardous waste (used oil and batteries).

(b) Packaging Department

Packaging department mainly generated recycle waste (used can, waste carton / tray, wooden pallet, paper layer pad, empty rice and malt bag, chemical drums, plastic frame), broken glasses, general waste (used plastic / paper sheet, used cap, waste label from labeler, used label from bottle washer, Ink cartridge item, sludge of caustic recovery tank).

(c) Brewing and Processing Department

Brewing and processing department mainly generated recycle waste (empty rice and malt bag), general waste (used plastic sheet, waste carton, waste paper, plastic bag, empty can, empty hop bag).

(d) Quality Assurance Department

Quality assurance department mainly generated include general waste (used plastic sheet, Waste carton, waste paper, plastic bag, empty can, empty hop bag) and hazardous waste (use chemical bottle).

(e) Engineering Department

Engineering department mainly generated hazardous waste (used oil, used battery, used empty paint pails, other scrap materials, old battery).

Table 3-16 Estimation of Monthly Produced Waste

No.	Monthly Waste		
1.	Can Body (Damage)	2808.3	kg
2.	Caron Box (Reject)	3570.6	kg
3.	Wooden Pallets (Damage)	825	pcs
4.	Paper Layer Sheet	13860	pcs
5.	Broken Rice Bags	660	kg
6.	Plastics Drums (Big)	26.4	pcs
7.	Plastics Drums (Small)	660	pcs
8.	Plastic Pallets (Damage)	0	kg
9.	Broken Bottles	2.00	tons
10.	Wooden Frame (Damage)	70.00	pcs
11.	Engine Oil 50 Gal	0.10	pcs
12.	Other (Plastic, paper,)	8.00	tons

Source Myanmar Carlsberg Company Limited

Table 3-17 Annual Chemical Consumption of the Factory

No.	Chemical Name	Area	Department	Consumption per year	Unit
1.	Horolift 'ft	Processing and filler CIP	B&P and Packaging	11820	Kg
2.	Caustic	All CIP	B&P, Packaging, WTP	65770	Kg
3.	Stabilon WT	All CIPs in B&P	B&P	800	Kg
4.	Oxonia	Processing CIP	B&P	2000	Kg
5.	Real	Membrane CIP	B&P	2520	Kg
6.	Nitric acid	Membrane CIP	B&P	350	Kg
7.	Topax 66	Foam Cleaning	Packaging	375	Kg
8.	Nacol 3DT222	Biocides	Packaging and Utilities	1128	Kg
9.	Nacol 7320	Pasteurizer	Packaging and Utilities	931	Kg
10.	Nacol 7330	Pasteurizer	Packaging and Utilities	113	Kg
11.	Dry Exx	Can conveyor	Packaging	2437	Kg
12.	Spectrum VT36	Cleaning	Packaging	304	Kg
13.	Lubodrive EC	Bottle conveyor	Packaging	480	Kg
14.	Stabilon TF	Bottle washer	Packaging	576	Kg
15.	Nalco ST70	Evaporative Condensers	Utilities	456	Kg

No.	Chemical Name	Area	Department	Consumption per year	Unit
16.	Nalco 90001	Evaporative Condensers	Utilities	60	Kg
17.	Nalco 780	Boiler	Utilities	300	Kg
18.	Optisperse PO 5068	Boiler	Utilities	300	Kg
19.	XY-12	UF, water treatment plant	Utilities	300	Kg
20.	Oxodes (HCL 9%)	Water treatment Plant	Utilities	12000	Kg
21.	Oxonet (Sodium Chloride 7.5)	Water treatment Plant	Utilities	12000	Kg
22.	Nalco PC191T/Flocon 290	Water treatment Plant	Utilities	300	Kg
23.	PC67	Water treatment Plant	Utilities	96	Kg
24.	PC33	Water treatment Plant	Utilities	96	Kg
25.	PC11	Water treatment Plant	Utilities	96	Kg
26.	PC77	Water treatment Plant	Utilities	96	Kg
27.	Malt	Mash in Screw	B&P	3492690	kg
28.	Rice	Mash Cooker	B&P	4171361	kg
29.	Black Malt	Mash in Screw	B&P	40732	kg
30.	Sugar	Wort Kettle	B&P	107190	kg
31.	HOP Pellet 90 Alpha	Wort Kettle	B&P	179	kg
32.	HOP IKE Alpha	Wort Kettle	B&P	1532	kg
33.	Aroma HOP Pellet	Wort Kettle	B&P	3595	kg
34.	Aroma Oil	Whirlpool	B&P	3725	ml
35.	Mash Tun H3PO4	Mash TUN	B&P	12133	kg
36.	CaCL2	Mash Cooker, Wort Kettle	B&P	9180	kg
37.	ZnSO4	Wort Kettle	B&P	33340	g
38.	CaSO4	Wort Kettle	B&P	1652	kg
39.	Caramel	Wort Kettle	B&P	7129	kg
40.	Yeast Food	Wort Kettle	B&P	3172	kg
41.	Termamyl SCDC	Mash Cooker	B&P	1835	kg
42.	Attenuzyme	Mash TUN	B&P	4316	kg
43.	ULTRAFLO MAX	Mash TUN	B&P	796	kg
44.	BREWER CLAREX	Wort Transfer to CCT	B&P	530	kg

No.	Chemical Name	Area	Department	Consumption per year	Unit
45.	KMS kg	Filtration	B&P	459	kg
46.	Kompleet	Brewhouse	B&P	3600	lit
47.	Pascal	Beer Process	B&P	14400	lit
48.	Divosan Forte	Beer Processing	B&P	3600	lit

Source Myanmar Carlsberg Company Limited

3.10.2. Wastewater

a) Production Process

The brewery factory discharges large volumes of highly polluting effluents throughout the process. It must also be noted that effluents from individual process are variable. For example, bottle washing results in a large wastewater volume, but it contains only a minor part of the total organics discharged from the brewery processes. On the other hand, effluents from fermentation and filtering are high in organic concentration but generally low in volume. Therefore, the annual estimated wastewater discharge from the brewery production process is around 1,720,000 L.

b) Domestic

Besides, domestic wastewater from canteen and employees' sanitation facilities are also collected and combined into the wastewater storage tanks. Generally, the annual estimated domestic wastewater discharge from the workers will be around 8,500 L.

Generally, the capacity of wastewater treatment plant is around 1,000 m³/d. All treated water from treatment plant is used for gardening. However, during the raining season, 90 % of the total treated water is discharged into nearby water bodies while only the rest 10% is used for gardening. The estimated waste balance diagram of wastewater treatment plant is shown in Figure 3-35.

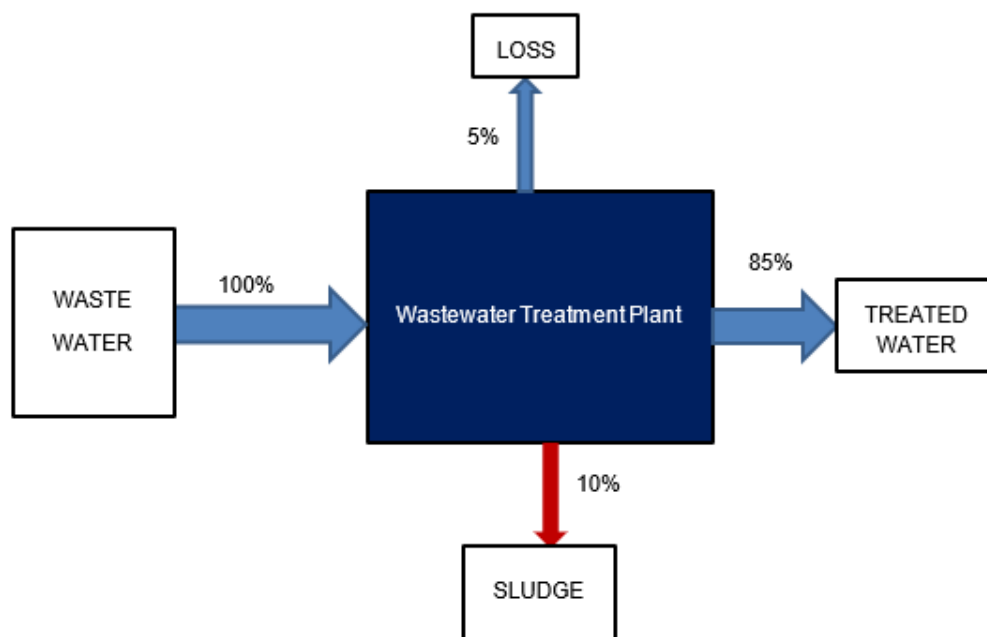


Figure 3-35 Waste Balance Diagram of Wastewater Treatment Plant

CHAPTER 4

SURROUNDING ENVIRONMENT

4.1. INTRODUCTION

In the EMP study, it is necessary to establish baseline information on the environment of an area because it needs to know not only the normal phase of environmental conditions but also negative impacts from the project operation phase of environment conditions. Baseline information study mainly involves two factors that are geographical study limit and contextual limit.

4.2. GEOGRAPHICAL STUDY LIMIT

The geographical study limit defined as the surrounding the project site from which the baseline information collection should collect. The project site is located in the south of Bago Region and which site is 53.78 acres size and about 7.24km distance far from Bago City. Around the 500-meter radius of the project, is the geographical study limit of the scoping study.

4.3. CONTEXTUAL STUDY LIMIT

The study area for project surrounding environment mainly consists of five groups. They are physical characteristics, biological characteristics, socio-economic characteristics, cultural characteristics and visual characteristics.

(1) Physical Characteristics

- Overview of the Study Area
- Meteorology
- Geography/Topography
- Regional Geology
- Seismology
- Hydrogeology

(2) Biological Characteristics

(3) Socio- economic Characteristics

- Population and Demography
- Health Conditions
- Main Economic Activities
- Level of Education
- Infrastructure
- Water supply
- Electricity and Energy Consumption
- Sanitary Waste Disposal System

- Major Access Road and Transport Service

(4) Baseline Environmental Quality

- Water Quality
- Air Quality
- Noise and Vibration
- Light and Temperature
- Land Use
- Wind Speed and Wind Direction

(5) Cultural and Visual Characteristics

- Religions
- Ethnicity

The following sections briefly describe each component with details in appendices appropriately. The data collection methods are also described as deemed necessary.

4.4. PHYSICAL CHARACTERISTICS

4.4.1. Overview of the Study Area

The Project is located at Block 3 to 13, Industrial zone (Foreign), Bago Township, Bago Township, Myanmar. Bago Township profile is presented in Table 4-1.

Table 4-1 Bago Township Profile

Capital	Bago
Number of wards	40
Number of village tracts	66
Number of villages	211
Total population	125,738
Area	1121.66 sq.km
Borders	
North:	Dike Oo
East:	Waw and Thanatpin
West:	Yangon, Hlegu, Tikekyi and Tharyarwaddy
South:	Ka Wa
Latitude	17° 14' and 17°50' N
Longitude	96°24' and 96°41'E
Ethnicities	Burma, Mon, Kayin, Shan, Indians and Chinese
Main economic activities	Forestry, Agriculture, Fishing, Factory

Source: General Administration Department of Bago Township, 2019

4.4.2. Meteorology

4.4.2.1. Methodology for Data Collection and Analysis

The meteorology is the study of climatic condition around of project site. The weather condition is collected from the secondary information source. It was available at Bago General Administration Department.

4.4.2.2. Climatic Conditions

The study area has tropical climate characterized by three seasons. The summer season normally begins in March to May. The rainy season normally begins in June to October. The winter season follows the rainy season, normally from November to February. During the course of a year, average temperature shows some variance. The highest temperature is 42.2°C where lowest temperature is 14.7°C. Reference from 2018 of year temperature and rainfall data are presented in Table 4-2.

Table 4-2 2019 Temperature and Rainfall Data in Bago Township

No.	Year	Rainfall		Temperature	
		Raining day	Total rainfall (Inches)	Summer season (Mix °C)	Winter season (Min °C)
1	2016	136	126.38	41.5	14.0
2	2017	140	148.62	39.3	13.0
3	2018	131	123.47	40.2	13.0
4	2019	111	101.1	42.2	14.7

Source: General Administration Department of Bago Township, 2019

4.4.3. Topography

Bago Township has located in the southern part of the Central Myanmar Belt, that has situated in Bago- Yoma Basin, which is one of the eight tertiary basins in the onshore of Myanmar. It is composed mostly of flat alluvial plains. The eastern part of the Bago Township drainage area and the western part is forested high-lands. The northern part is more highlands area and then has a valuable reserved forest. Bago River has originated from the Sin Na Maung Mountain of Bago-Yoma flows to the south of Yangon River. The topographic map of Bago Township is shown in Figure 4-1.

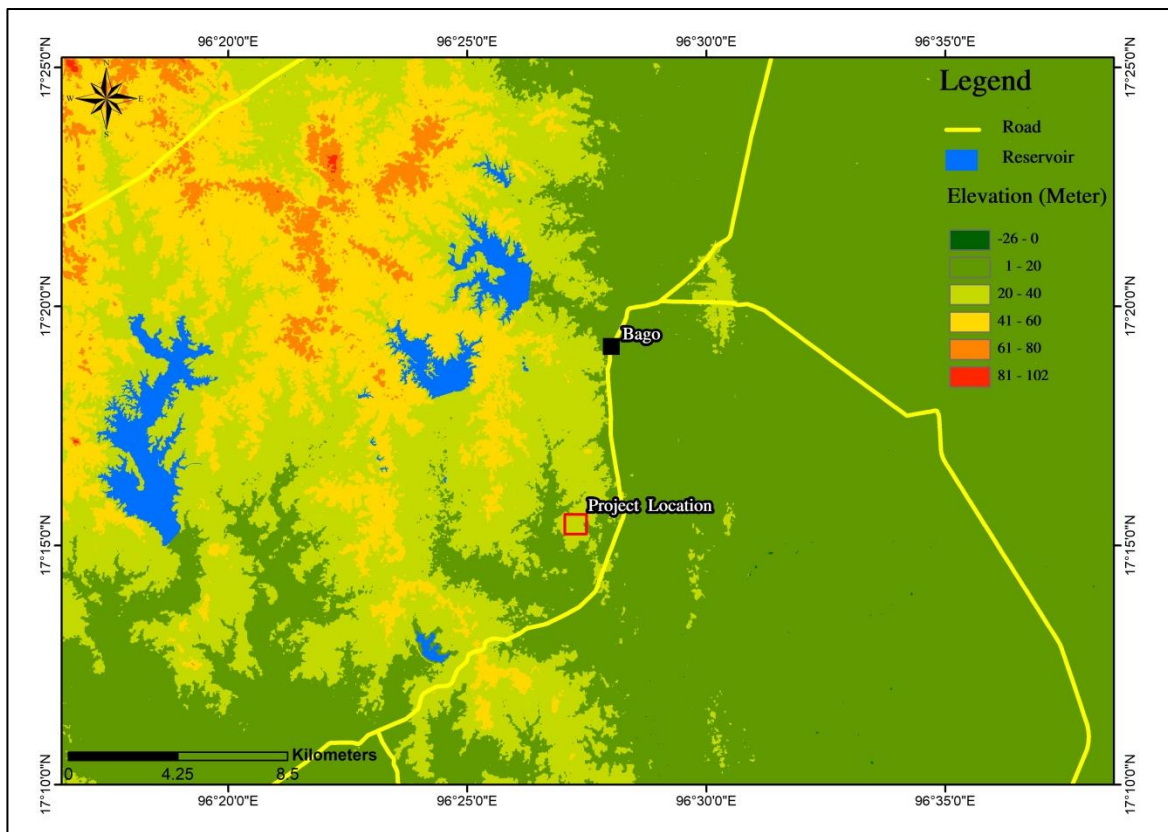


Figure 4-1 Topographic Map of the Project Area

4.4.4. Regional Geology

Burma can be divided into five geologic Townships: the northern mountains, the western mountains, the eastern plateau, the central basin and lowlands, and finally the coastal plains. The main lithology units cropped out in this Township are Irrawaddy Formation and Pegu Group. The proposed project area is mainly composed of Irrawaddy Formation. This Formation is mainly exposed at the north western part of the project area, which is characterized by alteration of mudstone, sandstone, and sandy mudstone. The sandstone is underlying the mudstone and is medium to coarse grain, highly loose and friable, grit and conglomerate with the subordinate bluish grey shale. Mudstone is of bluish grey color, moderately jointed, stiff and compact. The alluvial soil occurred in the eastern part of the proposed project area. Younger alluvium consists of stream deposits, gravel deposits, silty clay and light color sandy soils. Younger alluvium overlies the older alluvium of Quaternary, followed by Irrawaddy Formation of Pliocene age. Older alluvium is composed of silty clay, silty sand, sand and lateritic clay³. The stratigraphic succession and geological map of the study area is shown in Table 4-3 and Figure 4-2.

³ Khin Kyawt Kyawt Oo, 2013. Prediction of Ground Motion Parameters with Time History for Bago City, Bago Township, MSc (Thesis).

Table 4-3 Stratigraphic Succession of the Study Area

Description	Age
Alluvium	Holocene
.....Unconformity	
Irrawaddy Formation	Miocene -Pliocene
.....Unconformity	
Pegu Group	Lower-Middle Miocene

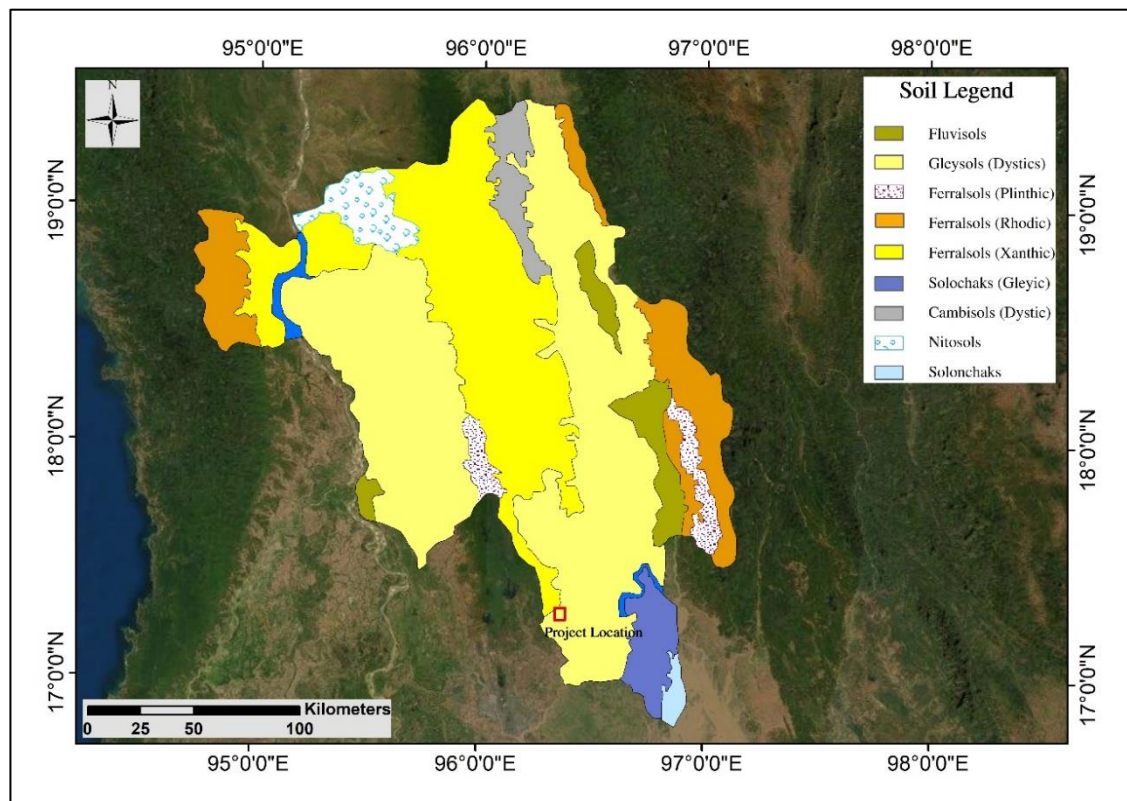


Figure 4-2 Geological Map of the Project Area⁴

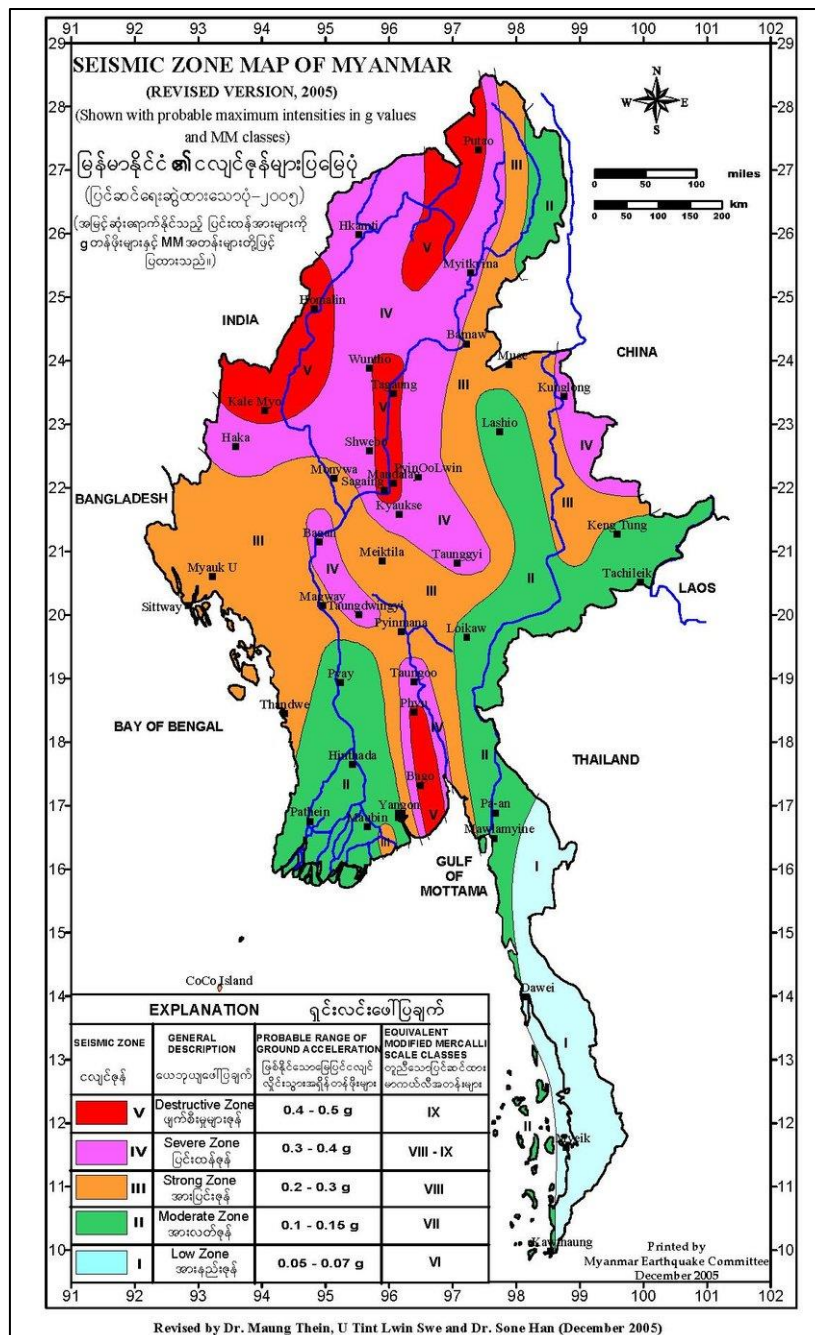
4.4.5. Seismology

The majority of the earthquakes in Myanmar classified into three zones. Bago has situated in the zone along the Sagaing Fault, which is one of the Great strike-slip faults of Southeast Asia, bisecting Myanmar from north to south. The faults form a remarkably straight boundary between the Miocene-to-Pleistocene sediments of the Bago-Yoma range and Holocene sediments of the alluvial Plain.

The seismic zone map of Myanmar is presented in Figure 4-3. The five seismic zones are demarcated and named (from low to high). A probable maximum range of ground acceleration in values and equivalent Modified Mercalli Scale classes given for each zone.

⁴ Khin Kyawt Kyawt Oo, 2013. Prediction of Ground Motion Parameters with Time History for Bago City, Bago Township, MSc (Thesis).

Bago Township is located in the severe seismic hazard zone in Myanmar. The earthquake occurred in this Township many times, with a number of strong damages.



Source: Meteorology and Hydrology Department, Yangon, Myanmar

Figure 4-3 Seismic Hazard Map of Myanmar

4.4.5.1. Earthquake in the Past

There are altogether 48 earthquake records in Myanmar during 868 to 2003. Among these, 12 records were in Bago, which are classified as one of the earthquake prone areas. The two major evidences during this period in Bago are:

The one occurred on 5 May 1930 was 7.3 Richter Scale, which caused widespread destruction of the town. It killed approximately 500 people in Bago and 50 in Yangon. It happened on the flat alluvial plains covered by rice paddy fields.

Another one was occurred on 22 September 2003 with moment magnitude 6.8. It was in central Myanmar, causing severe damage to rural houses and religious buildings. The earthquake had happened about 360 km north of Yangon. The location of the epicenter was at the western boundary of the Bago Yoma anticlinorium and the alluvial plain composed of the water-saturated silts and sandy loam. That earthquake damaged many non-engineered brick structures and rural houses, and extensive liquefaction failure of building foundations. About 180 rural houses, including some primary school buildings were severely damaged. Seven persons were dead and 43 injured. Summary of earthquakes in Myanmar is shown in Table 4-4.

Table 4-4 Summary of Earthquakes in Myanmar

Date	Location	Magnitude and / or Brief Description
868	Bago	Shwemawdaw Pagoda fell
875	Bago	Shwemawdaw Pagoda fell
1429	Innwa	Fire-stopping enclosure walls fell
24 July 1485	Sagaing	3 well-known pagodas fell
1501	Innwa	Pagodas, etc. fell
13 Sept 1564	Bago	Pagodas including Shwemawdaw and Mahazedi fell
1567	Bago	Kyaikko Pagoda fell
1582	Bago	Umbrella of Mahazedi Pagoda fell
9 Feb 1588	Bago	Pagodas, and other buildings fell
30 Mar 1591	Bago	The Great Incumbent Buddha destroyed
23 June 1620	Innwa	Ground surface broken, river fishes were killed after quake
18 Aug 1637	Innwa	River water flush
10 Sept 1646	Innwa	
11 June 1648	Innwa	
1 Sept 1660	Innwa	
3 April 1690	Innwa	
15 Sept 1696	Innwa	4 well-known pagodas destroyed
8 Aug 1714	Innwa	Pagodas, etc. fell; the water from the river gushed into the city
4 June 1757	Bago	Shwemawdaw Pagoda damaged

Note: Most of them along the Sagaing Fault

4.4.6. Hydrology

The major water sources in the study area comprise of Bago River and 3 ponds namely Zaletaw, Mazin and Kan Daw Gyi.

The main river of Bago is originated from Bago mountain range. It flows within north- south direction, through Bago and Yangon. There are sources of Zaletaw and Mazin ponds are Zaletaw and Mazin stream respectively. Both of them are tributaries of Bago

River. Hierologically, the area under investigation possesses two aquifers, alluvial aquifer and Irrawaddian aquifer. The quality of water in the Bago City is generally good in the area, covered by lateritic soil, Fe contents is high⁵.

4.4.7. Natural Plants

The natural plants are growth teak, Burmese iron wood, padauk, sal tree, Myanmar sal and tulip wood, garjan oil tree, cinnamon, siris, yellow champak, pine, mangrove, toon tree, Myanmar lacquer tree, kala siris, and eng, cobra's saffron, mango, chapalish, civit, indian jack fruit, rose apple, calophyllum, negro coffee, and bamboo are grew in the Bago Township.

4.4.8. Wild Animals

The elephant, tiger, leopard, wild boar, bear, dear, buffalo, guar, sambur, mountain goat, wild dog, hog-badger, wild cat, pangolin, monitor lizard, cow, chicken, monkey, banteng, peafowl, great egret, parrot, squirrel, hedgehog, and quail are found in the Bago Township.

4.4.9. Surrounding Environment

The trending north to south Bago-Yoma is situated alluvium plain in the east. The stream channel is flowing from Yoma and flows to the Sittaung River. Bago Division is situated near the Moe Yoon Gyi Inn from Pyin Pon Gyi village about (2 miles) in the east, Alaingni dam, and Mazin dam. Swa stream in the Yeter Shae Township, Ka Paung stream in the Taungoo and Oat Twin Township, Kwin stream, and Phyu stream in the Phyu Township and Mone stream in the Kyaukkyi Township are flowing to the basin within east Yoma and west Yoma. Moatkar stream, Kadin Belin stream, Thone Sel stream, and Gamone stream are flowing to the Myit Ka River in the Thar Yar Waddy Township. Thone Sel dam, Kadin Belin dam, Moatka dam, Thae Kaw dam, Min Hla dam, Gamone dam, Sint Gu dam, Bawbin (1/2) dam, and Taung Nyo dam are located in the Thar Yar Waddy District at the Bago Township.

4.5. BIOLOGICAL ENVIRONMENT

From the environmental impact point of view, biological resources are not relevant to the factory as it is located in the Industrial Zone.

4.6. SOCIOECONOMIC CHARACTERISTICS

The project site is located in the south of Bago Region. Development of any projects may cause social impacts on livelihood of the surrounding communities in the form of positive and negative impacts. Therefore, it is necessary to establish baseline information on socio-economic components of local communities. This action has to prevent and mitigate the adverse impact.

⁵ Khin Kyawt Kyawt Oo, 2013. Prediction of Ground Motion Parameters with Time History for Bago City, Bago Township, MSc (Thesis).

(1) Methodology

Information about livelihood's circumstance of the local communities was collected from secondary source. Secondary data were derived from officials at district and township levels. Published and unpublished papers and documents were searched from the reliable website.

4.6.1. Population and Demography

There are 40 quarters, 66 village tracts and 211 village in Bago Township. The population within 500m radius of the project area is in the Bago Township. There are Buddhist, Christian, Hindu, Islam and other religious live in Bago Township. The update number of populations is comprised in data of Bago General Administration Department. The following Table show in the Township data of Bago Township. Some households are not registered and not listed in township administration database. The list the number of households. The number of households in Bago Township is shown in Table 4-5.

Table 4-5 List the Number of Household in Bago Township

	Number of House	Household	Quarter	Village tract	Village
Town	38,565	43,679	40	-	-
Village	66,715	71,761	-	66	211
Total	105,280	115,440	40	66	211

Source: General Administration Department of Bago Township, 2019

4.6.2. Gender Issues

As shown in Table 4-6 male population in this study area is slightly higher than female. In general, man and women are equal in Myanmar, according to the key information; there is no gender issue in study area. Roles, work division and decision making between men and women are determined by physical conditions, social structure and norm. Decision making on some aspects are on a join or sharing basis by both male and female. Although some decisions are made by one side, it is also respected by the other. For example, men and women make decisions together on house purchasing, education for their children, religious activities, community activities and administration in household level.

However, men play a major role on agricultural activities, general employment and political interest while women dominate in cooking, children's education and religious activities.

Table 4-6 List the Number of Population and Gender Ratio

Description of Living Style	The population of the previous year	The population of the current year	Increasing population	Population growth rate	Gender ratio		
					Men	Woman	Ratio
Bago	437,222	439,622	2,400	0.55	209,429	230,193	1:0.9

Source: General Administration Department of Bago Township, 2019

4.6.2.1. Age Group

In Myanmar, age group of population is disaggregated based on election purpose. There are two (2) categories of under and over 18 years old. Population by age group at the township level of Bago is shown in Table 4-7.

Table 4-7 Population by Age Group in Bago

Township	Age 18 Years Old and over			Age Under 18-Year-Old			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Town	59,548	72,436	131,984	43,423	45,080	88,503	102,971	117,516	220,487
Village	66,190	67,559	133,749	40,268	45,118	85,386	106,458	112,677	219,135
Bago	125,738	139,995	265,733	83,691	90,198	173,889	209,429	230,193	439,622

Source: General Administration Department of Bago Township, 2019

4.6.2.2. Birth and Mortality Rate, Income and Outcome Rate

Birth rate, mortality rate and income and outcome rate of the people in the study area is derived from estimation by heads of quarter, village tract and village/quarter and key informants in the study area as shown in Table 4-8.

Table 4-8 Birth, Mortality, Income and Outcome Rate in Bago Township

Township	The population of the previous year	Estimate Birth Rate/Year	Estimate Death Rate/Year	Estimate Income Rate/Year	Estimate Outcome Rate/Year	The population of the current year
Bago	437,222	2,400	358	454	96	439,622

Source: General Administration Department of Bago Township, 2019

4.6.3. Health Conditions

According to village headmen, key informants and some health assistant villages, there were no serious health problems in the study area. The mortality and morbidity rates are low when compared with the whole population.

The diseases of high prevalence reported in May 2019 are Diarrhea followed by HIV/AIDS, Tuberculosis (TB), Malaria, Dysentery, and Hepatitis about the Township Health Profile 2019 of Bago Township, no accidental work injuries reported to the township hospital in 2019. The common diseases and lists of public health facilities are shown in Table 4-9 and Table 4-10.

Table 4-9 Common Diseases in the Project Area

Disease	Bago Township	
	Morbidity	Mortality
Malaria (Per 100000P)	14	-
Diarrhea (Per 100000P)	1070	-
TB (Sputum+) (Per 10000P)	273	-
Dysentery	-	-
Hepatitis	-	-

Disease	Bago Township	
	Morbidity	Mortality
HIV/AIDS	627	16

Source: General Administration Department of Bago Township, 2019

Table 4-10 Lists of Public Health Facilities in Bago

Township	Hospital	Urban Health Care Centre	Rural Health Care Centre
Bago	10	2	42

Source: General Administration Department of Bago Township, 2019

Table 4-11 Lists of Doctor and Nurse Ratio

No.	Residents	Doctors	Ratio of Doctor and Residents	Nurses	Ratio of Nurse and Residents	Health Assistant	Ratio of Health Assistant and Residents
1.	439,622	6	1:73270	4	1:109906	9	1:48847

Source: General Administration Department of Bago Township, 2019

4.6.4. Main Economic Activities

The majority income source of the people in the suburban area of Bago is from seasonal wage labor and employment in various factories in the Industrial Zone of Bago.

There are also a lot of government staff and retired staff who are living in Bago township. Generally, agriculture land is very abundant in rural areas. The majority of crops are paddy, beans, sesame, sunflower, cotton, sugarcane, and corn. Seasonal vegetables such as mushroom, bamboo shoots, watermelon, cucumber, and other fruits are also cropping in this area.

Employees are working in the Bago Industrial Zone. Some entrepreneurs are foreigners. Many numbers of employees are working in a garment. Unemployment in the study area is less because almost all peoples are adults, so they are working in factories, other seasonal jobs, and farming businesses. Some of them are working aboard, mostly in Thailand, Malaysia, and Korea. Most of the older persons and school children accounted for as unemployment. Employment and unemployment rates described in Table 4-12.

Normally, chicken, fish, and pig are raised for both home consumption and commercial purposes.

Small business exists in nearly every quarter and village, mostly in the form of small grocery shops to sell foods, drink, and household supplies.

Table 4-12 Number of Employment and Unemployment Rate

Township	Number of Employment	Number of Unemployment	Number of employees	Unemployment Rate
Bago	276,844	265,733	11,111	4.18

Source: General Administration Department of Bago Township, 2019

4.6.5. Level of Education

The majority of people in the project area have primary, middle, high school and university level. The majority of villagers in the study area have completed primary and secondary education. A few numbers have higher education level at the college and university level. Some elders received only informal rudimentary education from monks in temples.

Due to difficulty of transportation to Bago in some village tract, many students dropped out after primary education. In general, after finishing primary or post primary school, most of villagers start to work as wage labours in factories or temporary employed while some people are still in agriculture sector.

There are 1 post primaries, 11 primaries, 73 middle schools, 33 high schools, 28 Monastic schools and 1 university in the Bago Township. Source: Bago General Administration Department 2019.

I. Education

Educational data in Bago Township are shown as below.

Table 4-13 Higher Education

No.	Institution Name	Location	Size (Acre)	Teachers Number	Students Number	Teacher and Student Ratio
1.	Bago University	Oakthar (8)	718.65	297	8,833	1:29
Overall Township			718.65	297	8,833	1:29

Source: General Administration Department of Bago Township, 2019

Table 4-14 Basic Education High School

No.	Institution Name	Location	Size (Acre)	Teachers Number	Students Number	Teacher and Student Ratio
1.	B.E.H.S (1) Bago	Yone Gyi Quarter	8.252	90	3,611	1:40
2.	B.E.H.S (2) Bago	Zayy Wine	0.015	61	1,969	1:32
3.	B.E.H.S (3) Bago	Won Hlaing	2.6	83	3,350	1:40
4.	B.E.H.S (4) Bago	Zine/North	1.46	38	1,327	1:34
5.	B.E.H.S (5) Bago	Oakthar Myo Thit	13.74	49	1,737	1:35
6.	B.E.H.S (6) Bago	Nan Taw Yar	1.41	51	1,144	1:22
7.	B.E.H.S (7) Bago	Kalayar Ni	8.05	76	3,704	1:48
8.	B.E.H.S (8) Bago	Yone Gyi	2.102	28	840	1:30
9.	B.E.H.S (9) Bago	Hinthar Gone	2.93	46	1,706	1:37

No.	Institution Name	Location	Size (Acre)	Teachers Number	Students Number	Teacher and Student Ratio
10.	B.E.H.S (Phayar Gyi)	Phayar Gyi	10.67	65	2,007	1:30
11.	B.E.H.S (Inn Ta Kaw)	Inn Ta Kaw	12.89	71	2,734	1:38
12.	B.E.H.S (Htone Gyi)	Htone Gyi	10.10	45	1,121	1:24
13.	B.E.H.S (Kyauk Tan)	Kyauk Tan	12.21	45	1,127	1:25
14.	B.E.H.S (Pyin Pone Gyi)	Pyin Pone Gyi	6.7	16	1,851	1:40
15.	B.E.H.S (Oak Htakan)	Thaman Gone	2.63	23	663	1:28
16.	B.E.H.S (Baw Nat Gyi)	Baw Nat Gyi	5.95	34	1,162	1:34
17.	B.E.H.S (Htan Taw Gyi)	Htan Taw Gyi	7	38	908	1:23
18.	B.E.H.S (Zaung Tuu)	Zoung Tuu	9.03	32	987	1:30
19.	B.E.H.S (Wann Bal Inn)	Wann Bal Inn	2.91	35	1,212	1:34
20.	B.E.H.S (Lat Pan Win)	Lat Pan Win	4.65	28	774	1:27
21.	B.E.H.S (West Town – kha)	Late Pyar Kan	1.895	40	1,411	1:35
Overall Township				1,024	35,345	1:34

Source: General Administration Department of Bago Township, 2019

Table 4-15 Basic Education High School (Branch)

No	Institution Name	Location	Area (Aca)	Teacher Numbes	Students Number s	Teacher and Student Ratio
1.	BEHS (Branch – 5)	Mazin	0.385	32	1,149	1:35
2.	BEHS (Branch – 8)	Yat Kwyat Kyi	6.67	23	1,061	1:46
3.	BEHS (Branch –1)	Kyauk Kyi Su	0.57	26	769	1:28
4.	BEHS (Branch – 4)	Shin Saw Pu	0.7	31	746	1:24
5.	BEHS (Branch – 7)	Yat Kwyat Kyi	3.791	29	819	1:28
6.	BEHS (Branch) Sar Lay Kwin	Sar Lay Kwin	2.212	30	1,105	1:36
7.	BEHS (Branch) Pan Hlaing	Pan Hlaing	0.31	26	544	1:20
8.	BEHS (Branch) Inn Winn	Nann Taw Yar	2.521	32	1,065	1:33
9.	BEHS (Branch) Nat King	Nat King	1.878	21	578	1:27
10.	BEHS (Branch) Ka Twin Chen	Ka Twin Chen	1.68	30	986	1:32
11.	BEHS (Branch) Ka Mar Nat	Ka Mar Nat	2.049	39	1,271	1:32
12.	BEHS (Branch) Ponar Su	Ponar Su	1.28	36	1,075	1:32
Total				355	11,168	1:34

Source: General Administration Department of Bago Township, 2019

Table 4-16 Basic Education Middle School

No.	Institution Name	Location	Size (Acre)	Teachers Number	Students Number	Teacher and Student Ratio
1.	B.E.M.S (Monn Taing village)	Lathar Kone	1.894	15	392	1:26
2.	B.E.M.S (Zayy Nyaung Pin Gyi)	Zayy Nyaung Pin Gyi	0.57	12	411	1:34
3.	B.E.M.S (Zee Taw)	Zee Taw	0.8	14	486	1:34
4.	B.E.M.S (Hlaw Gar)	Hlaw Gar	0.54	11	369	1:33
5.	B.E.M.S (Thar Yar Gone)	Thar Yar Gone	0.8	19	608	1:32
6.	B.E.M.S (Tawa Bu Tar)	Tawa Bu Tar	1.11	13	405	1:31
7.	B.E.M.S (Phayar Tone Suu)	Phayar Tone Suu	0.21	20	776	1:38

No.	Institution Name	Location	Size (Acre)	Teachers Number	Students Number	Teacher and Student Ratio
8.	B.E.M.S (Kan Myint)	Kan Myint	1.42	13	464	1:35
9.	B.E.M.S (Ma Yinn Ywar Ma)	Ma Yinn Ywar Ma	0.46	11	365	1:33
10.	B.E.M.S (Pauk Taw)	Pauk Taw	3.04	18	613	1:33
Overall Township				146	4,889	1:33

Source: General Administration Department of Bago Township, 2019

Table 4-17 Basic Education Middle School (Branch)

No	Institution Name	Location	Area (Aca)	Teachers Number	Students Number	Teacher and Student Ratio
1.	BEMS (Branch) Khon Taing	Khon Taing	1	10	183	1:18
2.	BEMS (Branch) King Paing Kyone	King Paing Kyone	3.79	14	479	1:34
3.	BEMS (Branch) KaMaYa - 8	Wonn Bal Inn	0.19	10	101	1:11
4.	BEMS (Branch) Zaing Taung	ZaingTaung	0.366	16	293	1:18
5.	BEMS (Branch) Oak Thar	Nann Taw Yar	0.852	11	377	1:30
6.	BEMS (Branch) Faung Taw Oo	Zaing Taung	0.207	12	648	1:46
7.	BEMS (Branch) Late Pyar Kan	Late Pyar Kan	0.19	11	177	1:16
8.	BEMS (Branch) Sein Htun	Sein Htun	0.0125	11	201	1:18
9.	BEMS (Branch) Ba Yaint Naung	Hantharwaddy	0.741	15	272	1:18
10.	BEMS (Branch) Myot Twin Gyi	Myot Twin Gyi	2.85	14	363	1:25
11.	BEMS (Branch) Oak Thar - 2	Yat Kayot Kyi	0.219	10	252	1:25
12.	BEMS (Branch) Ba Hol Si	Nann Taw Yar	1.32	12	328	1:27
13.	BEMS (Branch) Yar Thit	Yar Thit	0.18	12	445	1:37
14.	BEMS (Branch) Hainn Tar Kone	Hainn Tar Kone	0.606	15	239	1:15

No	Institution Name	Location	Area (Aca)	Teachers Number	Students Number	Teacher and Student Ratio
15.	BEMS (Branch) Oak Thar - 4	Kyauk Taing Kan	1.297	15	372	1:24
16.	BEMS (Branch) Hmaw Kan	Shin Saw Pu	0.794	14	168	1:12
17.	BEMS (Branch) Oak Thar - 3	Yat Kayot Kyi	0.92	12	355	1:27
18.	BEMS (Branch) Mon San Pya	Hainn Tar Kone	3.5	12	308	1:25
19.	BEMS (Branch) All Ta Kall Law	Phyar Thone Sau	1.29	10	418	1:41
20.	BEMS (Branch) Phyar Kalay	Phyar Kalay	2.3	12	489	1:40
21.	BEMS (Branch) Ohh Bo	Phyar Kalay	0.39	12	331	1:27
22.	BEMS (Branch) Kan Bal	Wonn Bal Inn	2.21	11	259	1:23
23.	BEMS (Branch) Tat Kalay	Tat Kalay	1.41	16	422	1:26
24.	BEMS (Branch) Inn Ta Kaw – Sart	Inn Ta Kaw	1.52	11	373	1:33
25.	BEMS (Branch) Pyin Pone Yar Thit	Pyin Pone Yar Thit	0.848	15	547	1:36
26.	BEMS (Branch) Shwe Tan	Shwe Tan	0.99	12	372	1:31
27.	BEMS (Branch)	Aught Si Ti	0.29	11	154	1:14
28.	BEMS (Branch) Aa Wine	Aa Wine	1.01	152	402	1:33
29.	BEMS (Branch) Ta Yat Kone – Kayin	Ta Yat Kone	1.34	17	651	1:38
30.	BEMS (Branch) Kali	Kali	1.62	13	438	1:33
31.	BEMS (Branch) Sal Maing Kone	Sal Maing Kone	2.4	11	199	1:18
32.	BEMS (Branch) King Chaung	King Chaung	2.82	11	445	1:40
33.	BEMS (Branch) Nyaung Inn	Nyaung Inn	0.38	12	440	1:36
34.	BEMS (Branch) Kone Tan Dinn	Inn Ta Kaw	0.35	10	175	1:17
35.	BEMS (Branch) Kyate Day Yone	Kyate Day Yone	2.51	10	290	1:29
36.	BEMS (Branch) Ta Man Kone	Phayar Kalay	0.35	10	228	1:22
37.	BEMS (Branch) Gyate Than Shae	Gyate Than Shae	0.42	10	127	1:12

No	Institution Name	Location	Area (Aca)	Teachers Number	Students Number	Teacher and Student Ratio
38.	BEMS (Branch) Aught Sa Ti / Ya	Aught Sa Ti	1.29	11	155	1:14
39.	BEMS (Branch) Shan Yar Gyi	Shan Yar Gyi	0.21	14	529	1:37
40.	BEMS (Branch) Aught (West)	Aught (West)	0.42	9	93	1:10
41.	BEMS (Branch) Sar Thu Nge	Inn Ta Kaw	1.25	9	263	1:29
42.	BEMS (Branch) Ta Htay Kone	Ta Htay Kone	0.94	11	291	1:26
43.	BEMS (Branch) Aught Gabar	Aught Gabar	1.2	10	204	1:20
44.	BEMS (Branch) Tan Sot Pin	Tan Sot Pin	1.48	11	257	1:23
45.	BEMS (Branch) Pyinn Ma Ngu	Pyinn Ma Ngu	0.7	10	157	1:15
46.	BEMS (Branch) Kyoun Paung	Kyoun Paung	1.37	10	175	1:17
47.	BEMS (Branch) Kaut Chal	Kaut Chal	0.85	10	150	1:15
48.	BEMS (Branch) Lat Pan Winn	Lat Pan Winn	1.31	10	222	1:22
49.	BEMS (Branch) Ma Zin (Ka)	Kahlar Ni	2.17	10	383	1:38
50.	BEMS (Branch) Ba Yint Naung (Ma Zin)	Kahlar Ni	0.183	9	414	1:48
51.	BEMS (Branch) Shwe Min Gan	Phayar Gyi - 3	2.41	14	471	1:33
52.	BEMS (Branch) Ball Nat Gyi	Ball Nat Gyi	2.97	13	553	1:42
53.	BEMS (Branch) Wall Street	Phayar Gyi -2	0.87	13	515	1:39
54.	BEMS (Branch) Wunn Kabaw	Ta Yat Kone	4.92	12	396	1:33
55.	BEMS (Branch) Ta Mar Pin	Ta Mar Pin	1.72	10	166	1:16
56.	BEMS (Branch) Htone Gyi	Htone Gyi	0.41	12	298	1:24
57.	BEMS (Branch) Mae Khone	Mae Khone	0.47	13	310	1:23
58.	BEMS (Branch) War Paing	War Paing	1.23	10	197	1:19
59.	BEMS (Branch) Chin Su	Chin Su	1	9	185	1:20

No	Institution Name	Location	Area (Aca)	Teachers Number	Students Number	Teacher and Student Ratio
60.	BEMS (Branch) Aa Seik Taung	Aa Seik Taung	0.69	13	408	1:31
61.	BEMS (Branch) Kyauk Lone Gyi	Kyauk Lone Gyi	0.91	11	148	1:13
62.	BEMS (Branch) Thight Gyi	Thight Gyi	1.38	11	370	1:33
63.	BEMS (Branch) Mauk Ka La	Mauk Ka La	0.34	12	357	1:29
Total				192	19,784	

Source: General Administration Department of Bago Township, 2019

Table 4-18 Post Primary School

No	Township	School Number	Teachers Number	Students Number	Teacher and Student Ratio
1.	Bago	119	905	17,636	1:19
Total		119	905	17,636	1:19

Table 4-19 Basic Education Primary School

No.	Institution Number	Teachers Number	Students Number	Teacher and Student Ratio
1.	5	23	348	1:15

Source: General Administration Department of Bago Township, 2019

Table 4-20 Pre-Primary School

NO	Institution Name	Location	Teacher Number	Student Number	Ratio
1.	BEHS – 4 (Bago)	Zaing Myauk	2	60	1:30
2.	BEHS – 5 (Bago)	Quarter - 4	1	25	1:25
3.	BEHS – 7 (Bago)	Nann Taw Yar	2	60	1:30
4.	BEHS – 8 (Bago)	Kahlar Ni	1	15	1:15
5.	BEHS – Phayar Gyi	Shin Saw Pu	5	80	1:16
6.	BEHS – Zaung Thu	Phayar Gyi	1	27	1:27
7.	BEHS (Branch) Wann Bal Inn	Htan Tall Gyi	2	20	1:10
8.	BEMS (Branch) Gwae Than Shae	Zaung Thu	1	12	1:12
9.	BEMS (Branch) Ohh Bo	Wann Bal Inn	1	19	1:19
10.	Post Primary (Sai Ti)		1	32	1:32
Total			17	350	1:21

Source: General Administration Department of Bago Township, 2019

Table 4-21 Monastic School

No.	Institution Name	Location	Teachers Number	Students Number	Teacher and Student Ratio
1.	Min Galar Yama	Nann Taw Yar	99	3346	1:33
2.	Mahar Paduma	Kalhar Ni	19	707	1:37
3.	Kyae Ni Kan (oak)	Mazin	15	569	1:37
4.	Kyae Ni Kan (Kyat)	Mazin	9	322	1:35
5.	Atawka	Bo Kone	17	524	1:30
6.	Mahar Guni Kar	Inn Takaw	16	632	1:39
7.	Sit Kaing	Inn Takaw	8	316	1:39
8.	Aung Sati	Kyauk Twin Kone	13	205	1:15
9.	Shwe Taung	Zine (North)	12	371	1:30
10.	Nann Oo Shwe Sati	Melkhone Oaksu	8	318	1:39
11.	Danma Yatana	Zaung Tuu	14	281	1:20
12.	Aung Pyi Tar	Kyike Paw	12	360	1:30
13.	Shwe Kyaung Kone	Ware Mayan	8	156	1:19
14.	Dack Khi Na Yama	Phayar Gyi	17	468	1:27
15.	Aye Sati	Phayar Kalay	8	242	1:30
16.	Pann Gan Kone	Pan Gyan Kone	5	144	1:28
17.	Wai Lu Won	Kyauk Tann	17	311	1:18
18.	Mani Yama	Day Son Par	4	120	1:30
19.	Aung Bawdi Pin	Wann Bae Inn	7	124	1:17
20.	Ngare Inn Gyi	Phayar Ngatto	5	52	1:10
21.	Thike Kone	Gon Mani	4	42	1:10
22.	Paw Taw Mu	Oak Thar Myoe Thit	17	426	1:25
23.	Yadanar Aung	Theethant	6	152	1:25
24.	Thiri Zayar	Kyun Tharyar	8	253	1:31
25.	Nann Oo PoneNya Shin	Oak Thar Myoe Thit	8	283	1:35
26.	Mahar Bawdi	Mazin	6	121	1:20
27.	Thetdama Goneyi	Phayar Thone Su	10	361	1:36
28.	Aung Theikdi	Alaing Ni	5	156	1:31
Overall Township			377	11,362	1:30

Source: General Administration Department of Bago Township, 2019

Table 4-22 School-Age Children Enrollment

No.	5-year-old children			Enrollment			Rate of Enrollment (%)
	Male	Female	Sum	Male	Female	Sum	
1.	4,017	3,934	7,951	4,016	3,931	7,947	99.95%

Source: General Administration Department of Bago Township, 2019

Table 4-23 Matriculation Exam Success

No.	2017-2018				2018-2019			
	Official List	Take Exam	Pass	%	Official List	Take Exam	Pass	%
1.	7,988	7,500	2,452	33	8,536	8,040	2,669	33

Source: Townshpal Data, Administrative Department, Bago Township, 2019

Table 4-24 Percentage of Literacy

No.	Township Population	Over (15) Year Old population	Literacy Population	Literacy Rate
1.	439,622	432,158	430,197	95.55%

Source: General Administration Department of Bago Township, 2019

4.6.6. Infrastructure

4.6.6.1. Water Supply

Most of residents in the study area use tube well and a few of them use own hand pump. Although there is water supply system by Bago City Development Committee, it is not available for all households in suburb. So many households are invested for their own tube wells or buy water for domestic use.

Households and communities in the rural and remote areas are mostly self-reliant on water use source. They do not get any assistance for basic water needs. Some people boil water before use as drinking water.

4.6.6.2. Electricity and Energy Consumption

Nearly half of households in the study area, especially in suburb area of Bago can access to electricity supply while the rest of them cannot access. Many of them have own self-support electricity system and distribute within the same village.

Some villagers use solar power while a few of them have their own batteries or use candles. Charcoal and firewood are used as common fuel for cooking while a few use electricity for this purpose.

4.6.6.3. Sanitary Waste Disposal System

There is a service for waste collection and disposal in suburb area of Bago, being in charge by the City Development Committee. However, such a service is not available in rural villages of Bago. They mostly bury garbage at their places.

4.6.6.4. Major Assess Road and Transport Service

Yangon-Mandalay Road is the major assess road to Bago Township. As the factory is located within the Industrial Zone, it will cause not much difference to the current logistic condition. Therefore, transportation is not an issue for this factory.

Motorcycle is the most common way of transportation. Most of people own motorcycle and use it to connect around and between the villages, quarter including to Bago. Bicycle is also used mostly in some community. There are two lines of railway in Bago, connecting Yangon-Mandalay and Bago-Maw La Myine. And There are a number of bus lines too, but no water way and no airport.

Table 4-25 Bridges

No	Township	Types of Bridges				Total Bridge
		Iron	Concrete	Brick	Wood	
1.	Bago	52	202	36	2	305

Source: General Administration Department of Bago Township, 2019

Table 4-26 Banks

No	Township	Name	Government	Private	Total
1.	Bago	Myanmar Economic Bank	1	-	1
2.		KBZ Bank	-	6	6
3.		Global Treasure Bank	-	1	1
4.		CB Bank	-	1	1
5.		Yoma Bank	-	1	1
6.		Ayeyarwaddy Bank	-	1	1
Total			1	10	11

Source: General Administration Department of Bago Township, 2019

Table 4-27 Hotel and Travelling

No.	Name	Hotel		Total Rooms
		Government	Private	
1.	Gandamar	Government	-	42
2.	Htun	-	Private	24
3.	Shwe War Htun	Government	-	132
4.	Inperyar Motel	-	Private	31
5.	Myat Nandar	-	Private	22
6.	Sanfrancisco	-	Private	10
7.	Shwe Sesain Motel	-	Private	20

No.	Name	Hotel		Total Rooms
		Government	Private	
8.	Jade Garden Hotel	-	Private	29
9.	Bago Star Hotel	-	Private	32
10.	Palace Hotel	-	Private	14
11.	Hotel Mariner	-	Private	29
12.	Hin Thar Garden	-	Private	15
13.	Pwint Khaya	-	Private	15
14.	Amara Gold Hotel	-	Private	20
15.	Aroemar Hotel	-	Private	37
16.	Hantharwaddy Hotel	-	Private	48
17.	Oak Thar Kyaw Hotel	-	Private	29
18.	Shwe Pyi Hotel	-	Private	21
19.	Famous Hotel	-	Private	20
20.	Moe Yun Gyi (Resort)	-	Private	20
21.	Kanbawza Hinthar Hotel	-	Private	27
22.	Supreme Hotel	-	Private	30
23.	Hanthar Nann Hotel	-	Private	18
24.	Ngwe Hnin Hotel	-	Private	24
25.	Royal Lend	-	Private	32
26.	Hight Bago	-	Private	20
27.	Lansan	-	Private	24
Total		2	25	785

Source: General Administration Department of Bago Township, 2019

Table 4-28 Motel, Inn and Guest House

NO.	Number of Motel	Number of Inn	Number of Guest House
1.	4	8	2

Source: General Administration Department of Bago Township, 2019

Table 4-29 Supermarkets

No	Township	Name	Location
1.	Bago	ICON	Yone Gyi Ward

Source: General Administration Department of Bago Township, 2019

4.7. CULTURAL AND VISUAL CHARACTERISTICS

4.7.1. Religious Information

The majority of residents in Bago is Buddhism. A few of them are Christian, Hindu, Islam, and others as shown in Table 4-30.

Table 4-30 Population by Township in Bago

Township	Buddhist	Christian	Hindu	Muslim	Others	Total
Bago	411,380	17,135	6,137	2,925	2,045	439,622

Source: General Administration Department of Bago Township, 2019

4.7.2. Ethnicity

The majority of the people in Bago are Bamar (approximately 90%), followed by Kayin. Mon ethnicity is third populated in Bago area. The considerable number of others refers to FRC- Foreign Registration Card holder. Most of them are Indian and Chinese. List of the Ethnic Groups in Bago are shown in Table 4-31.

Table 4-31 List of the Ethnic Groups in Bago

No	Race	Population	Percentage
1.	Kachin	115	0.03
2.	Kayar	104	0.02
3.	Kayin	16,329	3.66
4.	Chin	463	0.11
5.	Mon	5,517	1.26
6.	Bumar	390,116	88.73
7.	Rakhine	793	0.18
8.	Shan	822	0.19
9.	Pa Long	1,574	0.36
10.	Pa Oh	5,568	1.29
11.	Danu	2,873	0.64
12.	Taung Yoe	2,165	0.49
13.	Ka Yan	0.5	0.5
Total		428,608	9.46

Source: General Administration Department of Bago Township, 2019

The population of the foreigner in Bago Township are below.

Table 4-32 Population of the Foreigner

No.	Township	Nationality	Population	Percentage
1.	Bago	Chinese	2788	0.63
2.		Indian	6389	1.46
3.		Pakistan	848	0.19
4.		Bangladesh	196	0.04
5.		Other	793	0.18
Total			11014	2.51

Source: General Administration Department of Bago Township, 2019

Bago township has many religious places like Buddhist Temple; Pagoda due to Buddhism is the majority of the country. List the number of religious buildings is shown in Table 4-33 and Table 4-34.

Table 4-33 List the Number of Religious Building (1)

Township	Temple	Pagoda	Monastery	Nunnery	Religious Hall
Bago	12	112	749	92	29

Source: General Administration Department of Bago Township, 2019

Table 4-34 List the Number of other Religious Building (2)

Township	Church	Hindu Temple	Mosque	Chinese Temple
Bago	17	29	16	3

Source: General Administration Department of Bago Township, 2019

4.7.3. Tourist Site, Culture and Religious Properties

Bago is one of the cultural and tourism destinations and highlight of second Myanmar Empire. The city has long historical story, in parallel with culture and religious. These issues support the city to be a famous tourist site.

Since Mon Kingdom period, there were many cultural buildings including historical famous pagodas and many tourism attractions sites. The well-known one is Kambawzatherdi old Palace of Hantharwaddy Archaeological zone in Bago. Of these areas, the list of tourism sites, religious buildings and cultural areas is shown in Table 4-35.

In addition, there are a number of man-made and natural scenic areas nearby the study area. There are man-made Zalettaw pond and natural steam from the end of Bago range near War Ma Yan Village.

Table 4-35 Religious Buildings and Cultural Area (Bago)

No	Name of Pagoda and Temple	Location
1.	Shwe Maw Daw Pagoda	Myot Dwin Gyi Ward
2.	Hin Thar Gone Pagoda	Bo Gone Ward
3.	Shwe Thar Hlyaung Pagoda	Ma Zin Ward
4.	Mya Thar Hlyaung Pagoda	Ma Zin Ward
5.	Sein Thar Hlyaung Pagoda	Ga Twin Chan Ward

No	Name of Pagoda and Temple	Location
6.	Ma Har Zaydi Pagoda	Ma Zin Ward
7.	Koe Thein Koe Than Pagoda	Oak Thar 1 Ward
8.	A Kyut A Lut Pagoda	Oak Thar 1 Ward
9.	Shwe Aung Yway Pagoda	Nan Taw Yar Ward
10.	Kyaik Pon Pagoda	Oaki Thar 6 Ward
11.	Shwe Gu Gyi Pagoda	Oak Thar 8 Ward
12.	Day Son Par Pagoda	Wan Bae Inn Ward

Source: General Administration Department of Bago Township, 2019

4.7.4. Visual Characteristics

The study area is mixed of suburb and rural settings. The residential area in the western part is crowded with high density of population as situated in the suburb area of Bago City. The industrial zone is also situated in the suburb area. Farmlands occupy in the rural area.

The dominant visual characteristic is monastery, located overall the area. Three reservoirs of Zalettaw, Mazin and Kan Daw Gyi are beside the Bago Township.

4.8. BASELINE ENVIRONMENTAL QUALITY

4.8.1. Water Quality

On 24th June 2020, water samples were collected at 4 points from the factory compound. As the brewery production process produces high concentrated wastewater, several parameters of untreated wastewater exceed the standard limit of NEQEG while almost all treated wastewater parameters from wastewater treatment plant are within the standard. The mitigation measures to improve water quality are mentioned in the CHAPTER 7. Laboratory results of water quality are also shown in **APPENDIX F**.

4.8.1.1. Untreated Wastewater

Untreated wastewater sample was collected from the wastewater equalization tank of the factory, situated at the 17° 15' 24.77"N and 96° 27' 10.72"E. Details of water quality results for both laboratory results and real time online monitoring results are shown in Table 4-36.

Table 4-36 Untreated Wastewater Quality Results

No.	Parameters	Results	Unit	Emission Standards
Laboratory Results				
1.	pH	5.9	S. U	6-9 ^a
2.	Temperature	25	°C	-
3.	Turbidity	186	FAU	5 ^b
4.	Dissolved Oxygen (DO)	0.13	mg/L	-

No.	Parameters	Results	Unit	Emission Standards
Laboratory Results				
5.	Free Cyanide	0.01	mg/L	0.1
6.	Total Phosphorous	0.9	mg/L	2
7.	Iron	4.7	mg/L	3.5 ^a
8.	Lead	ND	mg/L	0.1 ^a
Average Real Time Online Monitoring Results (Monthly)				
1.	pH	6.09	S. U	6-9 ^a
2.	Temperature	25.33	°C	-
3.	BOD ₅	-	mg/L	50
4.	COD	5768.57	mg/L	250
5.	Total Suspended Solids (TSS)	475.76	mg/L	50 ^a
6.	Total Dissolved Solids (TDS)	1011.29	mg/L	1000 ^b

^a National Environmental Quality Emission Guideline (2015)

^b Proposed National Drinking Water Standards, Ministry of Health (2014)

4.8.1.2. Treated Wastewater

Treated wastewater sample was collected from the treated wastewater tank of the factory which is situated at the 17° 15' 22.86"N and 96° 27' 10.75"E. Details of water quality results for both laboratory results and real time online monitoring results are shown in Table 4-37. According to the results, almost all values of monitoring parameters are within the standard limit of NEQEG.

Table 4-37 Treated Waste Water Quality Laboratory Result from Factory

No.	Parameters	Results	Unit	Emission Standards	Remarks
Laboratory Results					
1.	pH	7.1	S. U	6-9 ^a	Normal
2.	Temperature	25	°C	-	-
3.	Turbidity	5	FAU	5 ^b	Normal
4.	Dissolved Oxygen (DO)	4.8	mg/L	-	-
5.	Free Cyanide	0.01	mg/L	0.1	Normal
6.	Total Phosphorous	1.2	mg/L	2	Normal
7.	Iron	0.1	mg/L	3.5 ^a	Normal
8.	Lead	ND	mg/L	0.1 ^a	Normal
Average Real Time Online Monitoring Results (Monthly)					
1.	pH	7.62	S. U	6-9 ^a	Normal
2.	Temperature	25.59	°C	-	-
3.	BOD ₅	38.74	mg/L	50	Normal

No.	Parameters	Results	Unit	Emission Standards	Remarks
Laboratory Results					
4.	COD	84.81	mg/L	250	Normal
5.	Total Suspended Solids (TSS)	30.62	mg/L	50 ^a	Normal
6.	Total Dissolved Solids (TDS)	733.10	mg/L	1000 ^b	Normal

^a National Environmental Quality Emission Guideline (2015)

^b Proposed National Drinking Water Standards, Ministry of Health (2014)

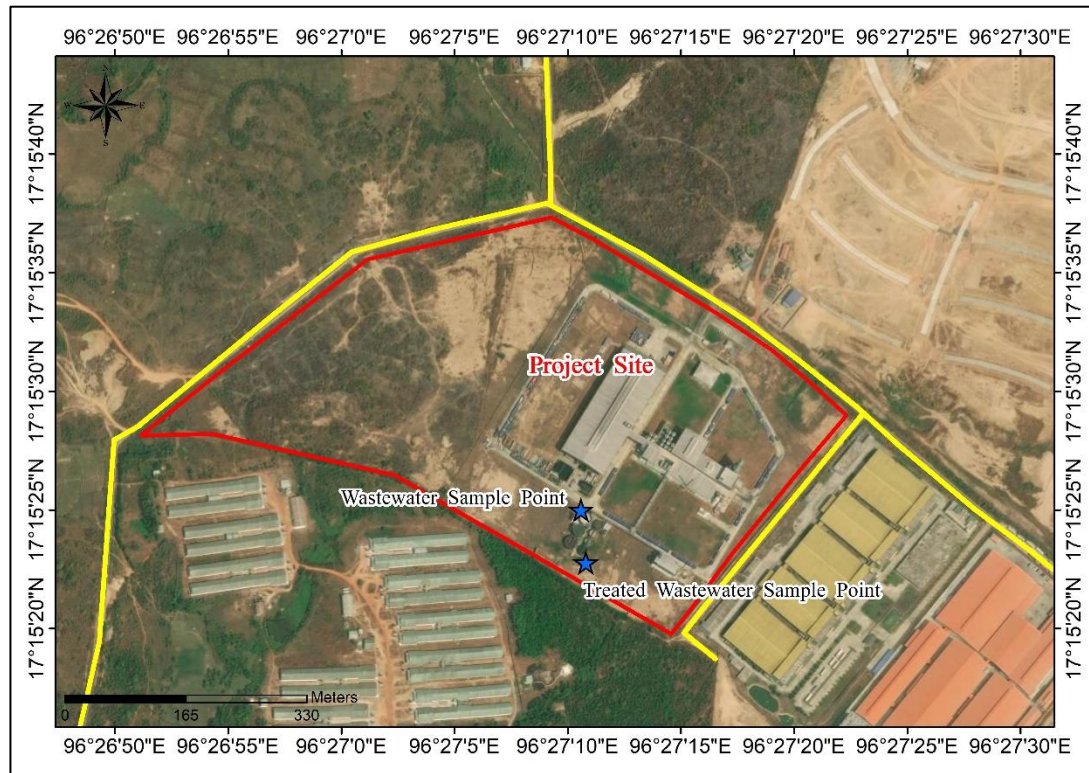


Figure 4-4 Wastewater and Treated Wastewater Sampling Points

4.8.1.3. Ground Water

Ground water sample was collected from the tube well of the factory compound which is situated at the 17° 15' 30.98" N and 96° 27' 18.58" E. Details of water quality results are shown in Table 4-38.

Table 4-38 Ground Water Quality Laboratory Result from Factory Compound

No.	Parameters	Results	Unit	Emission Standards	Remarks
1.	pH	6.4	S. U	6-9 ^a	Normal
2.	Temperature	25	°C	-	-
3.	Turbidity	5	FAU	5 ^b	Normal
4.	Total Dissolved Solids (TDS)	116	mg/L	1000 ^b	Normal

No.	Parameters	Results	Unit	Emission Standards	Remarks
5.	Total Suspended Solids (TSS)	0	mg/L	50 ^a	Normal
6.	Dissolved Oxygen (DO)	7.4	mg/L	-	-
7.	BOD ₅	12	mg/L	50	Normal
8.	COD	30	mg/L	250	Normal
9.	Free Cyanide	0.01	mg/L	0.1	Normal
10.	Total Phosphorous	0.25	mg/L	2	Normal
11.	Iron	0.1	mg/L	3.5 ^a	Normal
12.	Lead	ND	mg/L	0.1 ^a	-
13.	Total Nitrogen	0.5	mg/L	10 ^a	Normal

^a National Environmental Quality Emission Guideline (2015)

^b Proposed National Drinking Water Standards, Ministry of Health (2014)

4.8.1.4. Treated Ground Water

Ground water sample was collected from the tube well of the factory compound which is situated at the 17° 15' 30.98" N and 96° 27' 18.58" E. Details of water quality results are shown in Table 4-39.

Table 4-39 Treated Ground Water Quality Laboratory Result from Factory Compound

No.	Parameters	Results	Unit	Emission Standards	Remarks
1.	pH	6.3	S. U	6-9 ^a	Normal
2.	Temperature	25	°C	-	-
3.	Turbidity	5	FAU	5 ^b	Normal
4.	Total Dissolved Solids (TDS)	107	mg/L	1000 ^b	Normal
5.	Total Suspended Solids (TSS)	0	mg/L	50 ^a	Normal
6.	Dissolved Oxygen (DO)	6.98	mg/L	-	-
7.	BOD ₅	10	mg/L	50	Normal
8.	COD	30	mg/L	250	Normal
9.	Free Cyanide	0.01	mg/L	0.1	Normal
10.	Total Phosphorous	0.16	mg/L	2	Normal
11.	Iron	0.1	mg/L	3.5 ^a	Normal
12.	Lead	ND	mg/L	0.1 ^a	-
13.	Total Nitrogen	0.5	mg/L	10 ^a	Normal

^a National Environmental Quality Emission Guideline (2015)

^b Proposed National Drinking Water Standards, Ministry of Health (2014)

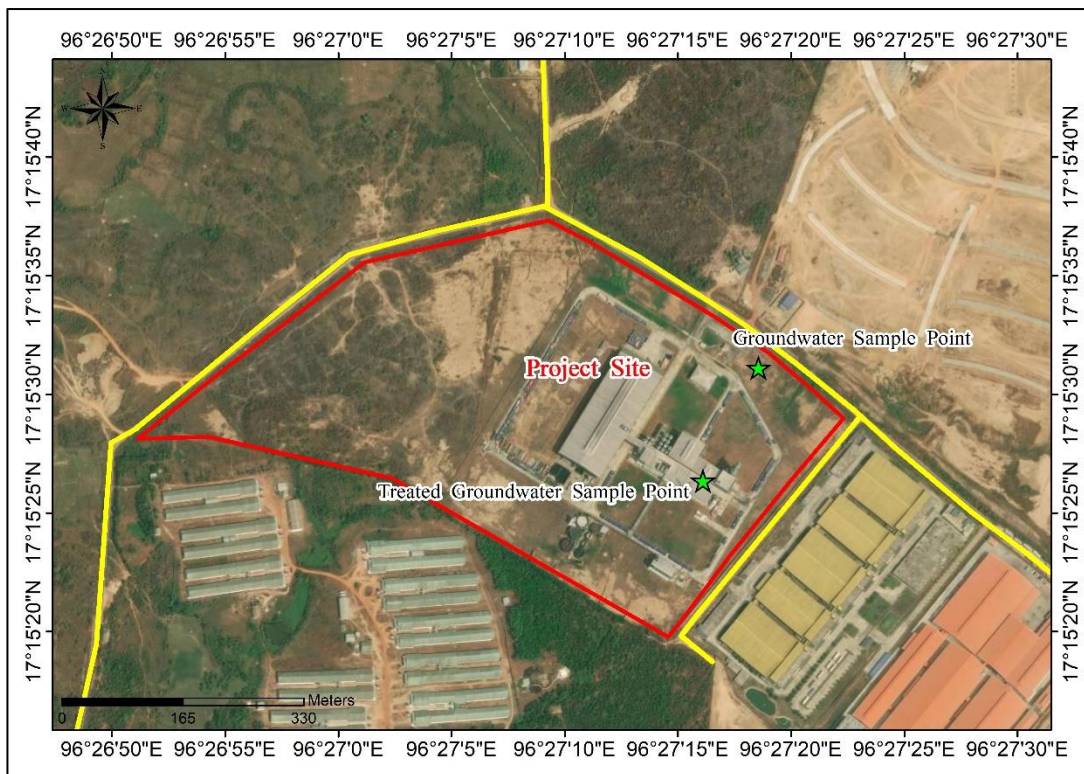


Figure 4-5 Ground Water and Treated Ground Water Sampling Points



Figure 4-6 Water Sample Collection

4.8.2. Air Quality

4.8.2.1. Monitoring with Haz- Scanner -EPAS

Air quality measurement was conducted in the study area for 24-hour from 14th July, 2020 to 15th July, 2020. Concentration of air pollutants are measured at 17° 15' 23.28" N and 96° 27' 14.13" E by using the Haz-Scanner. To reveal the existing status of baseline

air quality, the average air quality was compared with NEQEG guideline. All parameters' concentrations are within the standard limit. The mitigation measures to improve air quality are mentioned in the CHAPTER 7. Laboratory results of air quality are shown in **APPENDIX G**.

Table 4-40 Result from the Haz-Scanner

No.	Parameters	Result	Unit	Sampling Duration		*NEQEG Guideline value	Avg. Period
1.	Carbon dioxide (CO ₂)	362.9	ppm	24	hours	No Guideline = NG	-
2.	Carbon monoxide (CO)	115	µg/m ³	24	hours	NG	-
3.	Methane (CH ₄)	140.3	ppm	24	hours	NG	-
4.	Nitrogen dioxide (NO ₂)	-	-	-	-	40 µg/m ³	1-year
		75.5	µg/m ³	1	hour	200 µg/m ³	1-hour
5.	Ozone (O ₃)	26	µg/m ³	8	hours	100 µg/m ³	8-hour daily maximum
6.	Particulate Matter (PM ₁₀)	14.8	µg/m ³	24	hours	50 µg/m ³	24-hour
7.	Particulate Matter (PM _{2.5})	7.4	µg/m ³	24	hours	25 µg/m ³	24-hour
8.	Sulphur dioxide (SO ₂)	19.4	µg/m ³	24	hours	20 µg/m ³	24-hour
9.	Volatile Organic Compound (VOCs)	0.1	ppb	24	hours	NG	-
10.	Wind Speed	0.22	m/s	24	hours	NG	24-hour
11.	Wind Direction	78	Degree	24	hours	NG	24-hour
12.	Temperature	26	°C	24	hours	NG	24-hour



Figure 4-7 Air Mornitoring Point

4.8.2.2. Wind Speed and Wind Direction

Wind speed and wind direction were collected on 14th July, 2020 in 24 hours at 17° 15' 23.28" N and 96° 27' 14.13" E by using the Haz-Scanner. Measurement data for wind are described in Table 4-47 and Figure 4-18 respectively.

Table 4-41 Wind Speed and Wind Direction (24hrs)

No.	Wind Direction (Degree)	Wind Speed (m/s)
1.	73.25	0
2.	62.75	0
3.	75.5	0
4.	76.5	2.08
5.	81.75	3.35
6.	84	5
7.	83.75	4.63
8.	83	0.68
9.	56.25	0.8
10.	59.75	0
11.	84.25	0
12.	79.5	0
13.	122.5	1.13
14.	230.75	0.58

No.	Wind Direction (Degree)	Wind Speed (m/s)
15.	220.5	0.1
16.	54.75	0
17.	0	0
18.	0	0
19.	0	0
20.	37.75	0
21.	63.75	0
22.	75.5	0.24
23.	82.5	0.38
24.	88.25	0

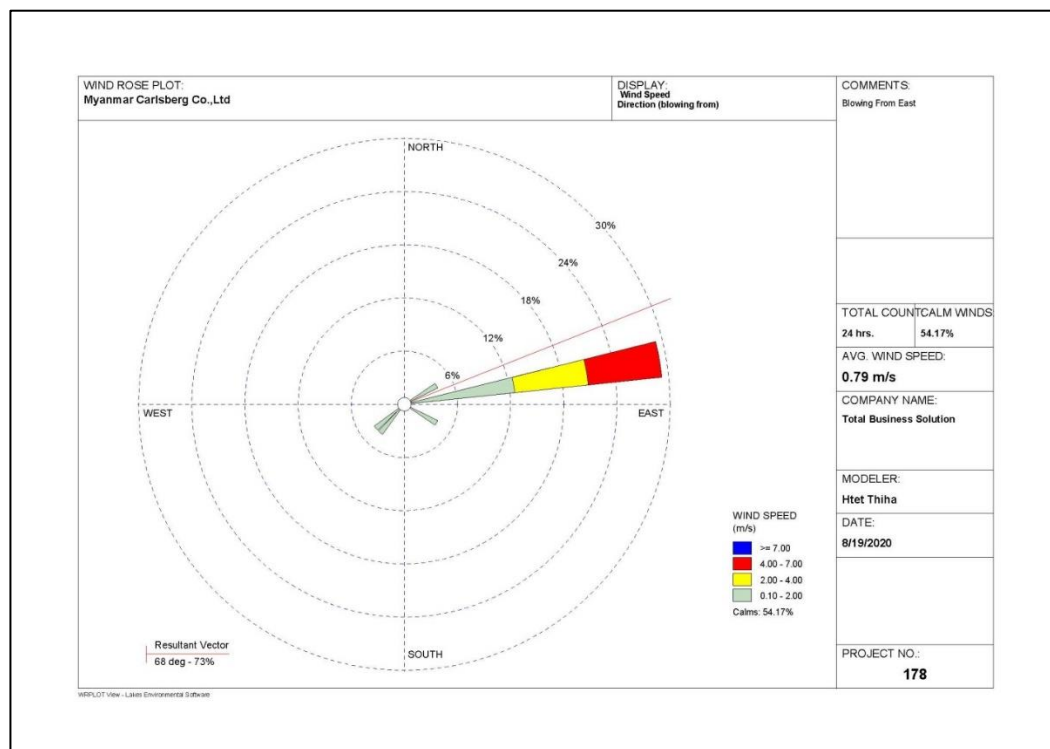


Figure 4-8 Wind Rose Diagram

4.8.3. Vibration

4.8.3.1. Monitoring with Bentech (Portable Vibration)

The vibration measurements were conducted at 6 points. The measurement method is a real-time measurement data display on the screen, which was recorded in the survey onsite paper. Vibration severity per ISO 10816 can be seen in Figure 4-9. Portable vibration measurement result of the factory can be seen in Table 4-42 and The portable vibration graph result can be seen in Figure 4-10.

VIBRATION SEVERITY PER ISO 10816						
Machine			Class I Small machines	Class II Small machines	Class III large rigid foundation	Class IV large soft foundation
In/s		mm/s				
Vibration Velocity Vrms	0.01	0.28				
	0.02	0.45				
	0.03	0.71		good		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		satisfactory		
	0.18	4.50				
	0.28	7.10		unsatisfactory		
	0.44	11.2				
	0.70	18.0				
	0.71	28.0		unacceptable		
	1.10	45.0				

Figure 4-9 Vibration Severity per ISO 10816

Table 4-42 Portable Vibration Measurement Result of the Factory

No	Site Description	Location		Measurement Result	Unit
		Latitude	Longitude		
1.	Cold Block	17° 15' 28.03"	96° 27' 15.26"	0.12	mm/s
2.	Brew House	17° 15' 26.71"	96° 27' 16.24"	0.16	mm/s
3.	Cold/ Hot Water Pump	17° 15' 26.38"	96° 27' 16.44"	0.18	mm/s
4.	Keg Production	17° 15' 28.16"	96° 27' 10.70"	0.14	mm/s
5.	Generator	17° 15' 26.00"	96° 27' 15.74"	00.3	mm/s
6.	Compressor Room	17° 15' 26.52"	96° 27' 14.89"	00.4	mm/s

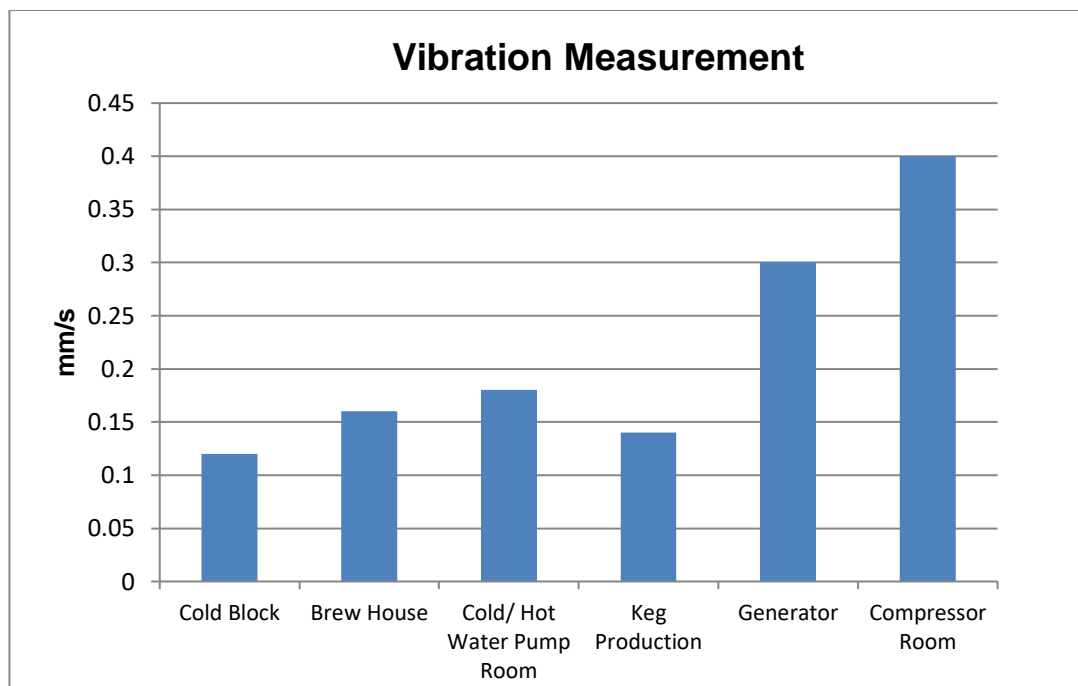


Figure 4-10 The Portable Vibration Graph Result

4.8.3.2. Monitoring with Nomis Seismograph Device

The vibration was measured with Nomis seismographs machine in the proposed factory compound at 17° 15' 23.51" N and 96° 27' 14.30" E on 14th July, 2020. The results are within acceptable level of the German Standard from DIN 4150. The result and German Standard from DIN 4150 can be seen in Table 4-43.

The vibration measurement activity, monitoring point and measurement results are shown in Figure 4-13.



Figure 4-11 Nomis Seismograph Vibration Measurement Activity



Figure 4-12 Vibration Monitoring Point

Table 4-43 German Standard Guideline

Structure Type	German Standards from DIN 4150 Peak particle velocity (mm/s)		
	4-8 Hz	8-30 Hz	30-100 Hz
Commercial and Industrial Building (Line 1)	20	20-40	40-50
Residential Building (Line 2)	5	5-15	15-20
Sensitive Building (Line 3)	3	3-8	8-10

Source: German Standard from Din 4150

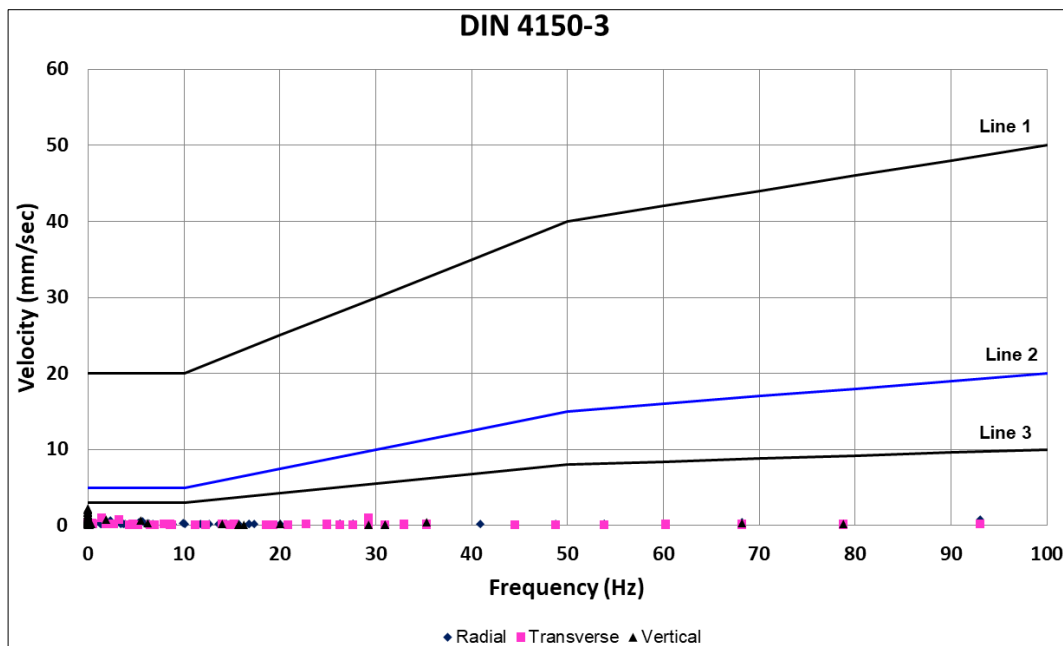


Figure 4-13 Vibration Result Graph

4.8.4. Noise

MONREC has issued National Environmental Quality (Emission) Guidelines to provide the basis for regulation and control of noise level. Noise impact should not exceed the standard levels presented in Table 4-4.

Table 4-44 Noise Level Standard

Receptor	One Hour LAeq (dBA) ^a	
	Daytime 07:00-22:00 (10:00-22:00 for Public holidays)	Nighttime 22:00 – 07:00 (22:00 – 10:00 for Public Holidays)
Residential, Institutional, educational	55	45
Industrial, commercial	70	70

^a Equivalent continuous sound level in decibels

Noise impacts may come from the operation phase and during noise measurement, noise meter is placed near operation. Then, noise measurement was conducted at site locations (17° 15' 26.35" N and 96° 27' 14.38" E) with BENTECH GM 1356 Model Digital Sound Level Meter (Automatic) on 14th July, 2020. Measurement locations were included in proposed factory building and compound. There are no significant negative impacts on the workers and nearby community because most noise results are below the noise standard value graph as shown in Figure 4-14.

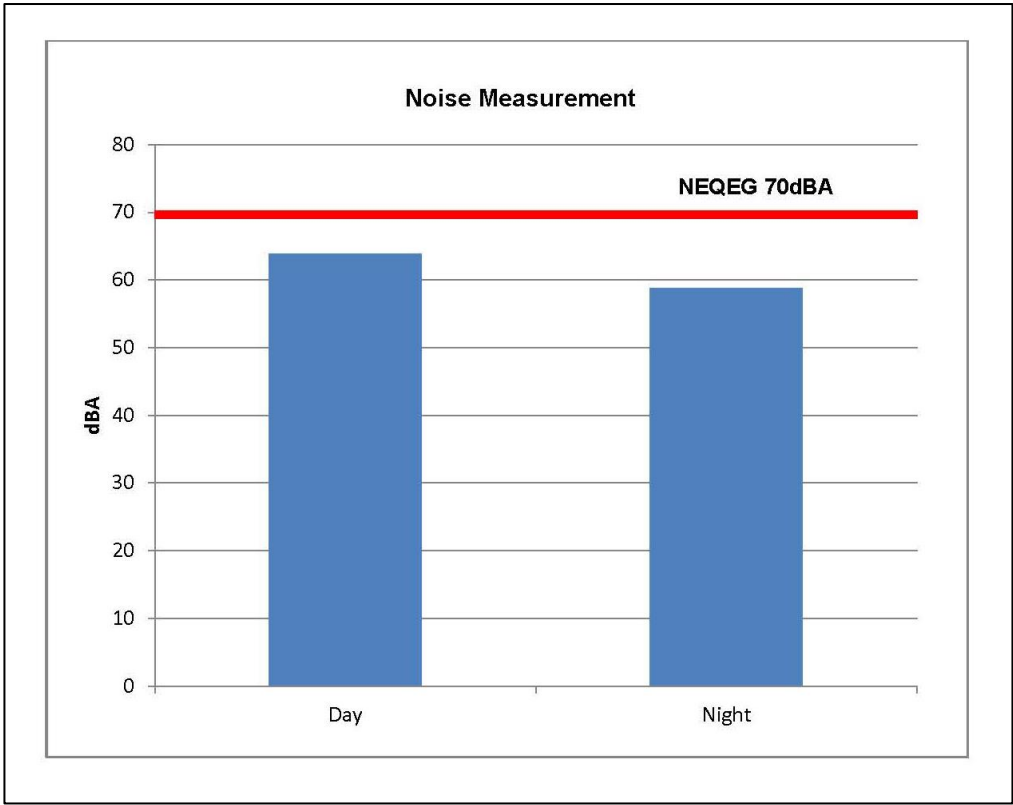


Figure 4-14 Noise Measurement Result (Day and Time)



Figure 4-15 Noise Level Measurement Activity



4.8.5. Lighting

Lighting is important for the work place such as laboratory and operation process. Light measurement was conducted 5 points with 1010 A Victor Model Lux Meter in the factory during 24th June, 2020 site visit. IFC Intensity Standard and Light Measurement Result are shown in Table 4-45, Table 4-46 and Light Measurement Result in Bar Chart is shown Figure 4-16.

Table 4-45 IFC Intensity Standard

No.	Location/Activity	Light Intensity (Lux)
1.	Emergency light	10
2.	Outdoor non-working areas	20
3.	Simple orientation and temporary visits (machine storage, garage, warehouse)	50
4.	Workspace with occasional visual tasks only (corridors, stairways, lobby, elevator, auditorium, etc.)	100
5.	Medium precision work (simple assembly, rough machine works, welding, packing, etc.)	200
6.	Precision work (reading, moderately difficult assembly, sorting, checking, medium bench and machine works, etc.), offices	500
7.	High precision work (difficult assembly, sewing, color inspection, fine sorting, etc.)	1,000 – 3,000

Source: International Finance Corporation Intensity Standard

Table 4-46 Light Measurement Result

No	Site Description	Location		Management Data	Measure value (Lux)
		Latitude	Longitude		
1.	Main Office	17° 15' 27.99"	96° 27' 12.30"	100.6	Lux
2.	Hot Block	17° 15' 26.71"	96° 27' 16.24"	37.7	Lux
3.	Control Room	17° 15' 27.12"	96° 27' 15.43"	52.6	Lux
4.	Cold Block	17° 15' 28.03"	96° 27' 15.26"	41.6	Lux
5.	Keg Production Line	17° 15' 28.16"	96° 27' 10.70"	68.2	Lux
6.	Generator	17° 15' 26.00"	96° 27' 15.74"	38.7	Lux
7.	Packing Lab	17° 15' 28.05"	96° 27' 12.35"	98.2	Lux
8.	Main Lab	17° 15' 27.35"	96° 27' 15.63"	53.2	Lux
9.	Clinic	17° 15' 30.32"	96° 27' 16.38"	441	Lux

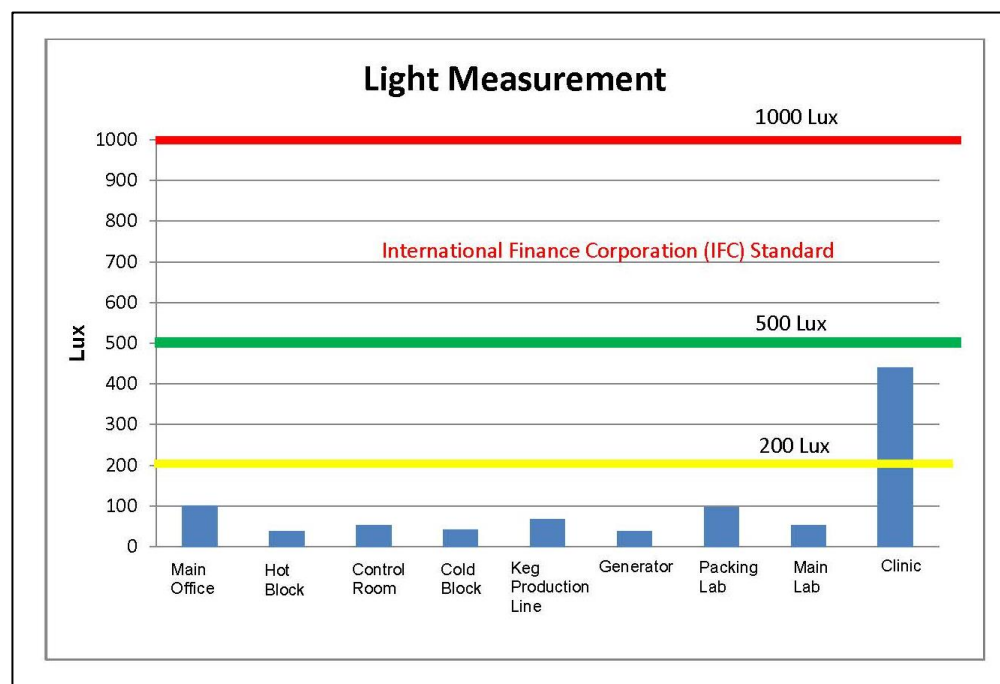


Figure 4-16 Light Measurement Result in Bar Chart

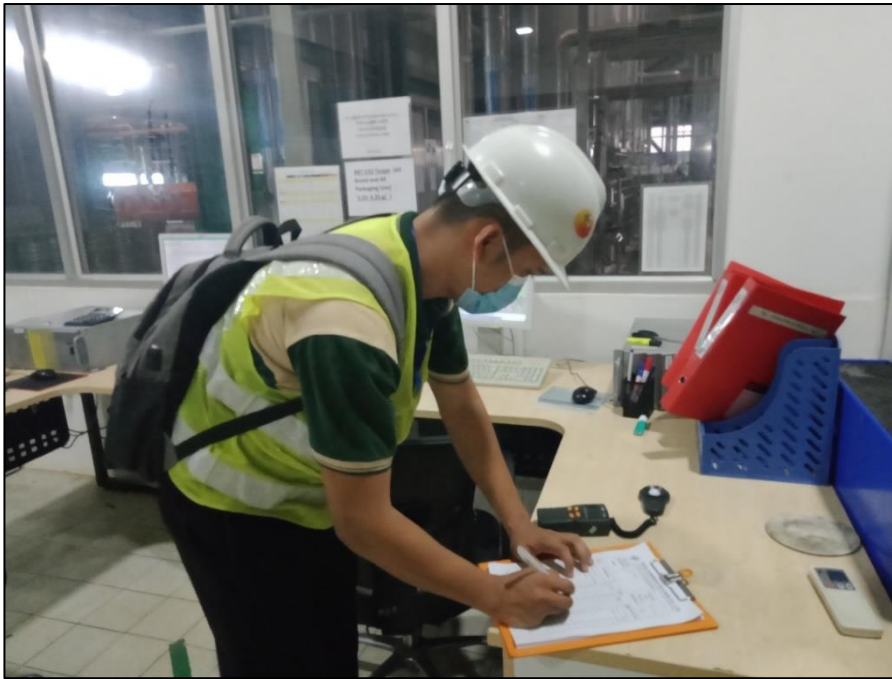


Figure 4-17 Light Measurement Activity

4.8.6. Temperature

Temperature is measured at 10 points with AR862D + Smart Sensor Model Infrared Thermometer in the operation room. When the results are compared with IFC standard value, all results are within the standard except keg production line and boiler. Regarding the exceed temperature in the boiler room and production area, it has been installed the proper ventilation system in these areas to reduce the room temperature. Besides, it is also manage to control the process in these area from the control room as much as possible. As a result, it will reduce the working hours for the workers in these area. Measurement data for temperature are described in Table 4-47 and Figure 4-18 respectively.

Table 4-47 Temperature Measurement Result

No	Site Description	Location		Measure Value (°C)	(IFC) Standard Value* (°C)
		Latitude	Longitude		
1.	Main Office	17° 15' 27.99"	96° 27' 12.30"	29.1	32
2.	Hot Block	17° 15' 26.71"	96° 27' 16.24"	32	
3.	Control Room	17° 15' 27.12"	96° 27' 15.43"	24.9	
4.	Cold Block	17° 15' 28.03"	96° 27' 15.26"	32	
5.	Keg Production Line	17° 15' 28.16"	96° 27' 10.70"	37.2	
6.	Boiler	17° 15' 22.69"	96° 27' 14.28"	38.4	
7.	Generator	17° 15' 26.00"	96° 27' 15.74"	30.7	
8.	Packaging Lab	17° 15' 28.05"	96° 27' 12.35"	29.6	

No	Site Description	Location		Measure Value (°C)	(IFC) Standard Value* (°C)
		Latitude	Longitude		
9.	Main Lab	17° 15' 27.35"	96° 27' 15.63"	29.2	
10.	Clinic	17° 15' 30.32"	96° 27' 16.38"	27.3	

*International Finance Corporation (Environmental Health and Safety Guideline) General

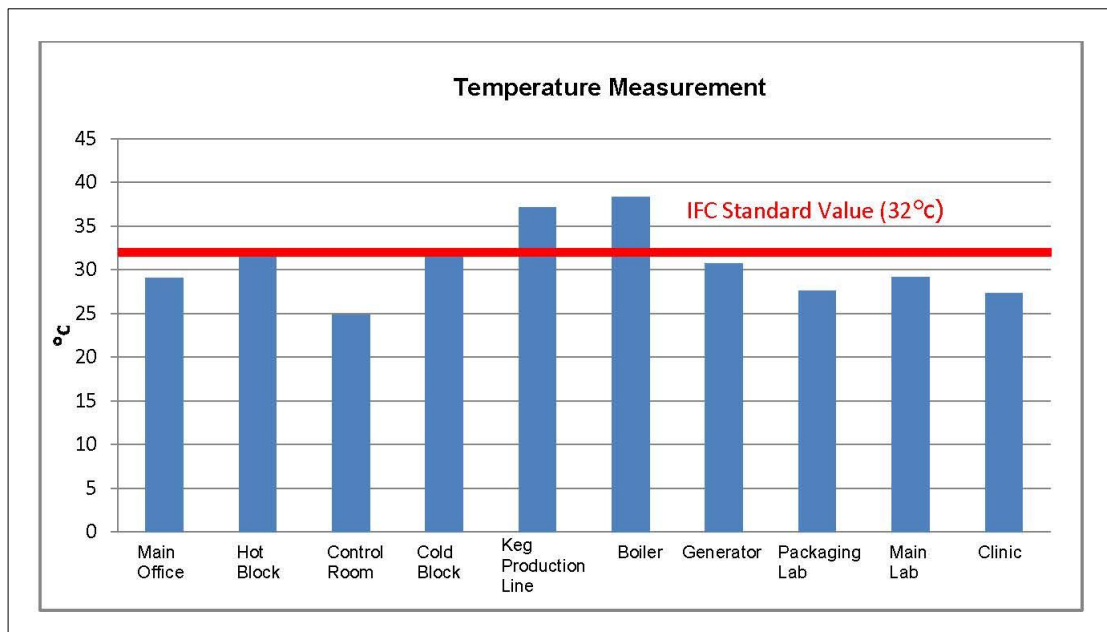


Figure 4-18 Temperature Measurement Results in Bar Chart



Figure 4-19 Temperature Measurement Activity

4.8.7. Land Use

4.8.7.1. Methodology

Information about land use was collected from secondary sources in combination with ground truth surveys. The survey helps to verify and fill gaps of secondary information.

a. Secondary Data Collection

Secondary data on land use was compiled from the following sources:

- Satellite image of GOOGLE EARTH
- Geographic Information System (GIS) of Bago township

Based on the secondary data, initial land use maps were prepared and used as a basis for subsequent ground truth surveys.

b. Ground Truth Survey

Ground truth surveys were conducted on 26th June, 2020 in the project site and around 1 km radius of the project site. This survey was used to verify land use information in the initial land use maps.

4.8.7.2. Result of the study

The study area consists of the proposed project site about 53.78 acres and 1km marginal area. The study area is characterized by 7 types of land use: (1) Industrial area, (2) Bareland, (3) Paddy Field, (4) Residential area, (5) Road, (6) Water body, (7) Religious area. Industrial area is largest portion within 1km marginal area where Religious area occupies smallest portion. The land use type and area are summarized and illustrated in Table 4-48 and Table 4-49.

Table 4-48 Land Use Type in the Study Area

No.	Name	Area (Hectare)	Percentage (100%)
1.	Industrial Area	166.12	52.81
2.	Bareland	89.68	28.51
3.	Paddy Field	32.75	10.41
4.	Residential Area	13.43	4.27
5.	Road	5.88	1.87
6.	Water Body	4.39	1.39
7.	Religious Area	1.69	0.54
8.	Commercial Area	0.61	0.19
Total			100

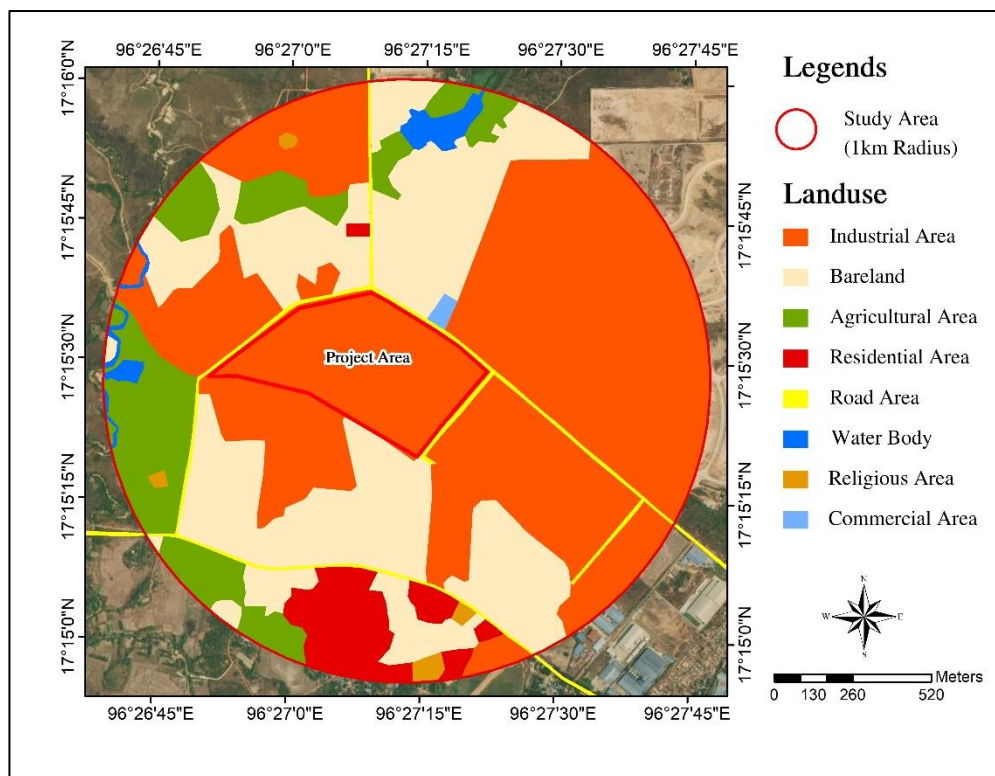


Figure 4-20 Land Use Map on Study Area

Table 4-49 Factory near by the Project Site

Location Number	Factory Name	Direction
1.	Myanmar CP Livestock Breeder Farm	South West
2.	Great King Group	South East
3.	Karisma Apparel (Myanmar) Co., Ltd	South East
4.	Sunjin Myanmar Livestock Co., Ltd	South East
5.	Melody Global	South East

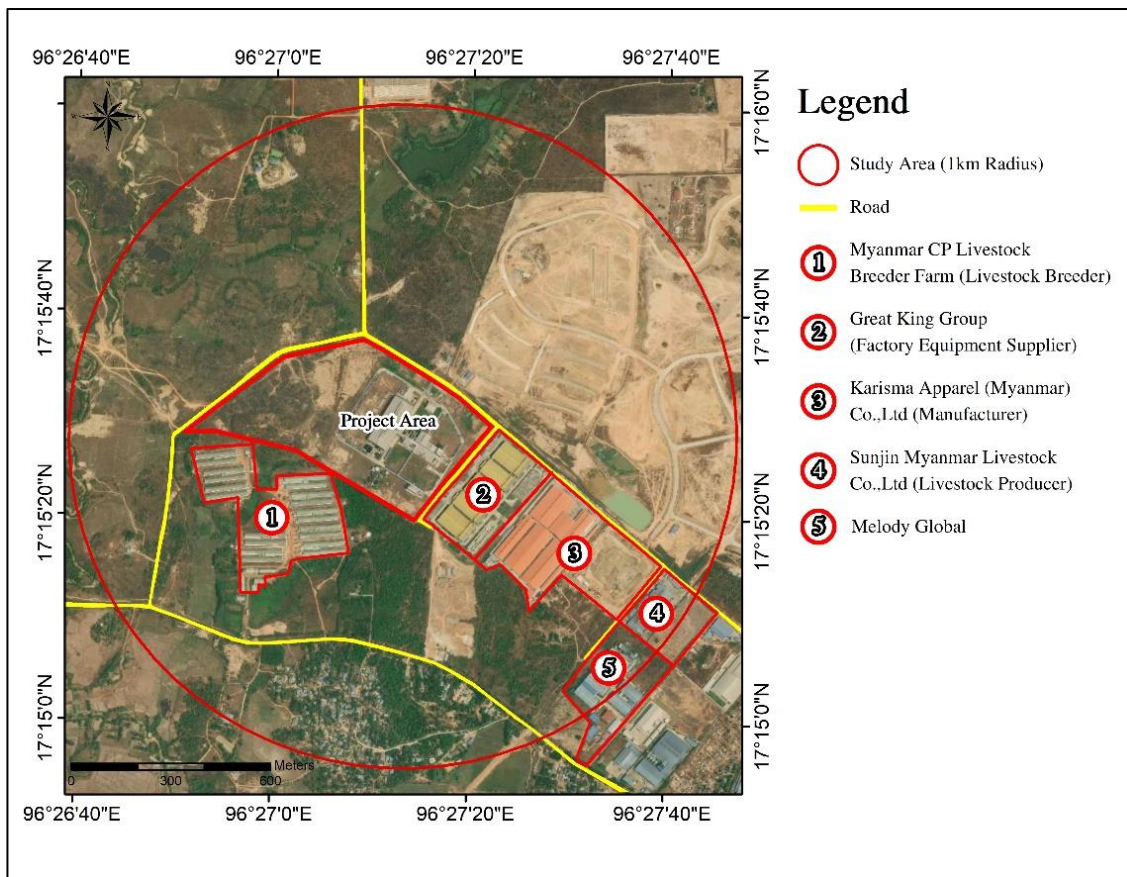


Figure 4-21 Adjacent Map on Study Area

Table 4-50 Land Use of Bago Township

No	Type of Land	Area (Aca)
1.	Net Area of Agricultural land	205,422
	Farmland	104,713
	Branches / Lands	5,906
	Garden Land	94,764
	Palm	37
2.	Pasture Land	5,189
3.	Industrial Land Use	1,820
4.	City Lands	12,293
5.	Village Lands	8,807
6.	Other Lands	38,857.4
7.	Reserved Forest/ Expend	395,842
8.	Wild Lands	945
9.	Areas that cannot be cultivated	58,789
Total		717,862.4

Source: General Administration Department of Bago Township, 2019

CHAPTER 5

POTENTIAL ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

5.1. SUMMARY OF ENVIRONMENTAL, SOCIAL AND HEALTH IMPACT ASSESSMENT

This chapter provides an assessment of potential impact arising from the project. The methodological approach used for the project impact assessment is adopted from Department of Environmental Affairs, Republic of South Africa (Sep. 2012), the Environmental Impact Assessment Regulation and the Federal Environmental Assessment Review Office (Nov. 1994), Reference Guide for the Canadian Environmental Assessment Act.

5.2. METHODOLOGY OF SIGNIFICANT IMPACT ASSESSMENT

The project activities are considered as sources capable of changing one or more environmental or social components. The assessment of impacts from the project activities includes the identification of the potential significant environmental impacts from the project. The evaluation of significant impact assessment considers four major factors such as probability, magnitude, extent and duration of impacts on the environment with the consideration of potential positive or negative impact.

5.2.1. Probability of the Impact

The probability of the impact is the likelihood of impact occurrence from the development project to the environment. If there is a high probability that the identified significant adverse environmental effects will occur, obviously they are possible to cause significant impact. Conversely, if there is a low probability of occurrence, the significant adverse environmental effects are improbable. Five levels of probabilities of impact occurrence are considered to calculate significance points as follows:

- very improbable (probably will not happen)
- improbable (some possibility, but low likelihood)
- probable (distinct possibility)
- highly probable (most likely)
- definite (impact will occur regardless of any prevention measures)

5.2.2. Magnitude of the Impact

Magnitude of the impact is determined based on severity of impact. In case of very high magnitude, the situation turns to be irreversible. High, moderate, low magnitude and insignificant impacts are thus considered to be reversible and acceptable by the public with proper mitigation plan. In addition, the insignificant impact will have no effects on the environment. There are five levels of magnitude to determine significant points as follows:

- Insignificant impact (the severity of impact is insignificant and will have no effect on the environment)
- Low impact (the severity of impact is low and will have small effect on the environment)
- Moderate impact (the severity of impact is moderate that cause some impacts on the environment)
- High impact (the severity of impact is significantly high but the impact can be reversible)
- Very high impact (the severity of impact is very high and that impact result into irreversible)

5.2.3. Extent of the impact

The extent of the impact expresses the spatial influence of the effects produced by an intervention on the environment. This refers to either a distance or an area over which a component will undergo changes. The five levels of extent of the impact due to the project are:

- Site-specific (the impact affects only a very restricted area in the proximity of the project site)
- Local (the impact affects a relatively restricted area located within, near or at a limited distance from the project site)
- Regional (the impact affects a region of area or small number of components located a significant distance from the project site)
- National (the impact affects a large geographic area or some of components located a significant distance from the project area)
- International (the impact affects to international level on the environment)

5.2.4. Duration of the impact

The duration of the impact describes the period of time during which a component undergoes changes due to the impact, is not necessarily equivalent to the period of time during which the direct source of impact is active. It must also take into consideration the frequency when the impact is intermittent. It characterizes as follow:

- A very short duration (the impacts on the environment are occurred within 0-1 year)
- A short duration (the environmental impacts are occurred within 2-5 years)
- Medium-term (the environmental impacts are occurred within 6-15 years)
- Long- term>15 years (the environmental impacts are happened over 15 years)
- A permanent period (the impacts are experienced continuously for the life of the facility or even beyond if the effect is irreversible)
-

5.2.5. Significance of the impact

The potential significance negative or positive environmental impacts caused by the project are identified by using a ranking scale such as occurrence and severity. Occurrence includes probability and duration of occurrence while severity means magnitude and extent of impacts. The following Table 5-1 is shown the ranking scales to use in assessing of each potential impact.

Table 5-1 Evaluation of Impact Assessment

Probability	Duration
1. Very improbable impact	1. A very short duration (0-1 year)
2. Improbable impact	2. A short duration (2-5 years)
3. Probable impact	3. Medium-term (6-15 years)
4. Highly probable impact	4. Long- term>15 years
5. Definitely impact	5. A permanent period
Magnitude	Extent
1. Insignificant impact	1. Site-specific impact
2. Low impact	2. Local impact
3. Moderate impact	3. Regional impact
4. High impact	4. National Impact
5. Very high impact	5. International Impact

The following formula is used to assess the environmental significance of each potential impact.

$$\text{Significance Points (SP)} = (\text{Magnitude} + \text{Extent} + \text{Duration}) \times \text{Probability}$$

In order to assess the likely significant environmental and social impacts of the Project, the impact assessment is preliminary identified based on the project description and overall environmental and social conditions. The potential environmental impacts are classified on the basis of negligible, low, moderated, and high significance and it can be seen in Table 5-2.

Table 5-2 Potential Environmental Impacts Rating

Significance Points	Environmental Significance
<15	Negligible
15 - 30	Low
31- 60	Moderate
>60	High

5.3. POTENTIAL ENVIRONMENTAL, SOCIAL AND HEALTH IMPACTS DURING CONSTRUCTION AND DECOMMISSION PHASE

The project construction would produce a considerable amount of potential environmental related issues, but their impacts on the local community and natural environment would be quite low since it is a small-scale factory construction site.

Majority of the impacts create in construction phase will be transient in nature. However, proper planning on construction site, waste disposal, and health and safety procedures could be effectively managed.

The construction activities would consist of installation of necessary machinery, small building construction, and alternative activities of M & E processes. Therefore, the potential negative impacts on environment would be at the minimum level. In Table 5-3 it shows the evaluation and prediction of potential environmental impacts' significant during construction phase.

5.3.1. Negative Impact on Air Quality

During construction and decommission phase, emission of fugitive dust resulting from the concrete mixing, digging concrete floor, construction vehicle circulation and site preparation for the construction activities such as blasting of rocks, earth moving, and exposure of bare soil to wind. In addition, secondary air pollution source was occurred by exhaust from diesel generator, earth moving equipment, and on-site open burning of solid waste. The construction activities for renovation process could be considered as a small-scale civil work.

5.3.2. Negative Impact on Noise and Vibration

During construction and decommission phase, the operation of heavy equipment and earthmoving machinery can cause noise and vibration disturbance to surrounding community such as site clearing, pile driver operation, excavation equipment, cranes, operation of concrete mixer, equipment transportation, emergency generator and related building construction works. These nuisance noises and vibration will be limited and mostly site-specific is not much effected to the environment or local communities as the project is located in the industrial zone.

5.3.3. Negative Impacts on Water Quality

During construction and decommission phase, water required for all construction and decommission activities and domestic will be used from the groundwater (tube wells). Anyhow, the construction time is limited, and construction activities are not much extensive. Therefore, not too much wastewater is generated from construction and decommissions activities. Only domestic wastewater was produced depending on the number of construction workers during day shift. The domestic wastewater generated from the construction site was from toilet and wash water. Therefore, this is insignificant volume of water discharge and could be negligible of environmental impact.

5.3.4. Negative Impact on Land

The site clearing including removal of vegetation and top soil was carried out around the project site to implement the installation of infrastructure. However, these landuse changes due to the project factory can be assumed as moderate impact to the surrounding environment.

5.3.5. Negative Impact on Soil

Construction and decommission activities for the project factory can create soil contamination such as leakage of fuel and oil and other various wastes on the ground.

5.3.6. Negative Impact on Solid Waste

- Non-Hazardous Waste

Residual wastes were generated during the factory construction and decommission phase. Source of solid waste will be from the removal of top soil and old structures, faulty construction activities and other construction and decommission wastes such as small concrete spills, scrap wood and metals. Other non-hazardous wastes consist of domestic waste discharged from workers such as plastic, garbage, glass and food waste.

- Hazardous Waste

Hazardous wastes from the construction and decommission stages such as treated timber, concrete additives, asbestos, contaminated soils, preservative, adhesives, paint, fluorescent light tubes, and lead-acid batteries can cause potential negative environmental impacts due to improper management of solid waste.

However, the factory managed solid wastes properly during construction and will also manage properly during decommission stage. Therefore, the potential negative impacts will be low since the solid wastes are treated properly during construction and decommission stages.

5.3.7. Negative Impact on Occupational Health and Safety

The potential impacts on health and safety during construction and decommission phase are listed below.

- Slips and falls due to the unskilful workers
- Working at height of building during roofing and painting.
- Increased temperature of equipment surface.
- Dusty in the ambient air of the working zone.
- Moving machinery can cause temporary hazards such as vehicle traffic and accident in moving and lifting equipment.
- Risk from handling or being exposed to hazardous materials that will be used at the construction site.

5.3.8. Negative Impact on Cultural Heritage

The factory is established in Bago Industrial Zone in which the cultural heritage such as archaeological sites and traditional building and monuments are not existed. Therefore, the activities that can cause potential negative impacts on cultural heritage will not be happened during construction and decommission stages.

5.3.9. Negative Impact on Ecosystem

There may be no significant impacts on surrounding ecosystem since the project is located in the industrialized area and there is no protected areas, reserved forests and wetlands, threatened species and national parks near the factory area. Although civil works from the construction and decommission of factory may generate impacts on fauna and flora, the scale of impact is expected to be negligible.

5.3.10. Potential Positive Impacts

There will be positive impacts on local people due to job opportunities and the materials and equipment may be purchased from local shops during construction and decommission stages of the factory. Therefore, potential positive impacts on their livelihood are expected.

Table 5-3 Evaluation and Prediction of Significant Impacts for Construction and Decommission Phase

Potential Impact	Activities and Source	Components	Magnitude	Extent	Duration	Probability	Score	Significant
Potential Negative Impacts								
Air	Construction and decommission activities, diesel generator and vehicle movement	CO ₂ , NO ₂ , CO, CH ₄ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂ , VOCs	3	2	2	4	28	Low
Noise and Vibration	Emergency use of diesel generator and the operation of construction equipment and heavy vehicles	Noise and vibration	3	1	2	4	24	Low
Water	Surface runoff, domestic wastewater	Organic Matter in wastewater	2	2	2	3	18	Low
Land	Removal of vegetation and top soil Installation of infrastructure	Landuse change	3	2	4	4	36	Moderate
Soil	Civil work	Leakage of fuel, oil and other various wastes	3	2	3	2	16	Low
Solid Waste	Civil work and wastes from workers	Residue waste and domestic waste	3	2	2	2	14	Low
Occupational Health and Safety	Workers' health during construction and decommission	Infectious disease; such as AIDS/HIV, Hepatitis B/C, etc. and other physical injuries	2	1	2	4	20	Low

Cultural Heritage	Civil works near cultural heritage areas	Archeological sites and traditional building	1	1	1	1	3	Negligible
Ecosystem	Civil works	Flora and Fauna	1	1	1	3	9	Negligible
Potential Postive Impacts								
Potential Positive Impacts	Civil works, raw materials and equipments purchasing	Employement and business opportunities	3	2	2	4	28	Low

5.4. POTENTIAL ENVIRONMENTAL, SOCIAL AND HEALTH IMPACTS DURING OPEARATION PHASE

The following are predicted impacts during operation phase of manufacturing of brewery factory;

- Air Quality
- Water Quality
- Soil
- Solid Waste
- Noise and Vibration
- Offensive Odour
- Occupational Health and Safety
- Ecosystem
- Potential Positive Impacts

Not all of the impacts during operation phase are affected directly to local communities. However, some environmental impacts are primarily related to the factory in which resource utilization is an issue that should be seen from a sustainable development perspective and utilization of raw materials, emission and occupational health and safety for employees working at the proposed factory. All of the impacts' significance during operation phase is presented in Table 5-4.

5.4.1. Negative Impacts on Air Quality

During the operation phase, activities such as fugitive dust from loading and unloading of raw materials and cleaning floor can cause air pollution. In addition, emergency used of generators, raw materials transportation, energy consumption for breweryproduction, and products distribution may emit particulate matters such as CO₂, NO₂, CO, CH₄, O₃, PM₁₀, PM_{2.5}, SO₂, VOCs. However, it can be concluded, as the impact is not significant because the generator and vehicle movements will run only a short time and the energy consumption for this factory use hydropower electricity. Therefore, any harmful gaseous air pollutants will not be produced. Although air quality of this factory can be poor, the impact can be insignificant sincethe project is located in the industrial zone.

5.4.2. Negative Impacts on Water Quality

During the operation phase, discharge of untreated wastewater from breweryproduction processes (e.g. rinsing process) and effluent discharge to the nearby waterbodies can cause water pollution. However, the impact will be moderate since the factory treated wastewater properly with wastewater treatment plant.

5.4.3. Negative Impact on Soil

During the operation phase, the transportation of raw materials, glass bottles and cans can cause soil contamination such as leakage of fuel and oil and other various wastes on the ground. However, the magnitude of impact will be insignificant.

5.4.4. Negative Impacts from Solid Waste

5.4.4.1. Solid waste from Factory

Improper solid wastes discharge such as disposal of spent grain, hops, trub and yeast, diatomaceous earth slurry, and packaging materials can cause negative impact on the environment. However, the impact will be low since by products such as spent grain, hops and trub are sold as the livestock feed, renewable energy or soil improver and uncontrolled land filling will be avoided in any form. In addition, the packaging wastes such as used can, waste carton, wooden pallet, paper layer pad and plastic frame will be handled by reuse, recycle method or treated separately. Since the industrial wastes are properly managed by project proponent, the negative impact on the environment is less likely to occur.

5.4.4.2. Solid waste from workers

During operation phase, solid waste is generated from the workers are plastic, paper, glass and food waste. The solid wastes from workers in the project site will less likely to cause the adverse effects to environment.

5.4.5. Negative Impacts on Noise and Vibration

During the operation phase, manufacturing processes such as milling process may cause noise and vibration on the surrounding environment. However, the magnitude will be at a limited scale.

5.4.6. Negative Impacts on Offensive Odour

During the operation phase, although manufacturing processes such as fermentation process can cause offensive odour, the extent of the processes will be within the specific site. Therefore, the impact can be negligible.

5.4.7. Negative Impacts on Occupational Health and Safety

Factory will use light tubes for general lighting purposes. This includes space lighting and task lighting. Activities of the workers in the operating sector depend on the quality of light; thus, it is important to provide sufficient lighting to those areas.

Physical injuries may occur in workplaces such as fall on slippery floors, accidents from the improper use of machines and tools, electricity shock and improper product loading and unloading in store.

5.4.8. Negative Impacts on Ecosystem

Improper discharge of untreated wastewater and solid waste from the production processes can cause certain adverse impact on nearby aquatic ecosystem and habitats of flora and fauna. However, the possibility is unlikely since the factory manage wastewater and solid wastes properly.

5.4.9. Positive Impacts

The socio-economic impacts are considered as positive because more jobs opportunities are created during operation phases of the project. The factory workers

comprising both skilled and unskilled will be recruited from the local community. The project proponent will implement the following practices during operation phase:

- Promote the fair treatment, non-discrimination and equal opportunity for workers;
- The Project proponent plans to increase the production capacity in this years, nearby communities will get benefit by being the source of work force for the factory;
- Ensure total compliance with national labor and employment laws;
- To avoid exploitation of child labor by contractor, sub-contractor and supply chain;
- Promote safe and healthy working conditions;
- Project proponent should try to mitigate or minimize negative impacts while enhancing and maximizing the positive impacts to their optimum.

Table 5-4 Evaluation and Prediction of Significant Impacts for Operation Phase

Potential Impacts	Activities and Source	Components	Magnitude	Extent	Duration	Probability	Score	Significant
Potential Negative Impacts								
Air	Diesel boiler operation, diesel generator and vehicle movement	CO ₂ , CO, CH ₄ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , VOCs	2	2	4	3	24	Low
Water	Discharge of untreated wastewater from brewery production process	BOD, COD, Antibiotics, Oil and Grease, Total Nitrogen (TN), Total Phosphorous (TP), Total solid (TS), Total Oxygen Demand, Total coliform bacteria	3	2	4	4	36	Moderate
Soil	Logistic transportation	Leakage of fuel, oil and other various wastes	2	3	4	3	27	Low
Solid Waste	Mashing and filtration processes	Spent grains, trub, hops, general wastes and chemical wastes	3	2	4	3	27	Low
Noise and Vibration	Use of machineries for operation process and Emergency use of diesel generator	Noise and vibration	2	1	4	3	21	Low
Offensive Odour	Fermentation process	Offensive Odour	2	1	4	4	28	Low
Occupational health and safety	Workers' health in operation area	Infectious disease; such as AIDS/HIV, Hepatitis B/C, etc. and other physical injuries	3	1	4	3	24	Low
Ecosystem	Wastewater and solid waste discharge	Impacts on aquatic ecosystem and habitats	2	2	4	3	24	Low

Potential Positive Impacts								
Potential Positive Impacts	Purchasing raw materials and equipments	Job and business opportunities	3	3	4	4	40	Moderate

5.5. MITIGATION MEASURES TO BE TAKEN DURING CONSTRUCTION AND DECOMMISSION PHASE

The Project proponent shall take all these mitigation measures. Potential environmental impacts and mitigation measures during construction and decommission for air pollution, noise, wastewater and solid waste are presented in Table 5-5.

Table 5-5 Environmental Impacts and Mitigation Measures during Construction and Decommission Phase

Potential Impacts	Source	Mitigation Measures
Air Pollution		
<ul style="list-style-type: none"> ○ Inhalation of dust ○ Dust dispersion to the nearby community ○ Respiratory tract infection (asthma). ○ Eye irritation ○ Shortness of breath ○ Decrease visibility ○ Harming plants 	<ul style="list-style-type: none"> ○ Traffic emission ○ Combustion processes such as diesel engines ○ Fugitive gases from loading operations and losses from equipment. ○ Paint and other related chemical for construction activities. 	<ul style="list-style-type: none"> ○ Dust suppressant should be used where necessary by spraying water to affected area. ○ All activities transporting construction and demolition waste should be covered to minimize the spreading of dust. ○ Dust filter mask should be provided to workers. ○ Open burning should be prohibited. ○ Purchase vehicles and equipment that emit lowest CO₂. ○ Banning of old diesel or gasoline powered vehicles for construction and decommission activities by defining specific types and ages of vehicle. ○ Improved in the quality of diesel/ gasoline for construction and decommission related vehicle/equipment. ○ Vehicle speed limit should be restricted around the project site. ○ Restore, resurface and rehabilitate the disturbed area as soon as practicable after completion of construction or demolishing.
Solid Waste		

Potential Impacts	Source	Mitigation Measures
<ul style="list-style-type: none"> ○ Related health hazards such as cholera and other vector transmitted diseases ○ Creating air pollution (especially unpleasant odor) ○ Significant surface or underground water pollution from the leachates 	<ul style="list-style-type: none"> ○ Site clearance activities. ○ Construction and demolishing processing material waste such as iron, steel scrap, fly ash, wood pieces, clay, brick, stone, ceramics, rubber, gypsum, wire, aluminum products, light bulbs, etc. 	<ul style="list-style-type: none"> ○ Coordinate with city development community for systematic waste disposal and collection system. ○ Prepare proper waste bins or containers for separate waste collection in construction site. ○ Provide enough storage area for construction and decommission materials. ○ Inspect temporary waste disposal site regularly. ○ Prohibit open burning waste in the project site. ○ Health impact training for workers related to waste handling.
Wastewater		
<ul style="list-style-type: none"> ○ Significant surface or underground water pollution from the leachates ○ Related health hazards such as cholera and other vector transmitted diseases 	<ul style="list-style-type: none"> ○ Domestic wastewater from construction workers ○ Fuel leakage form civil works ○ Surface water run-off from construction and decommission site 	<ul style="list-style-type: none"> ○ Provide proper sanitation facilities for the construction workers. ○ Prepare proper fuel storage area such as putting fuel tank on the concrete slab instead of natural ground within the construction and decommission site. ○ Regular inspection of the construction machines and maintaining the good condition. ○ Provide proper temporary drainage system for construction and decommission site. ○ It is essential to store a certain amount of absorbable material like sand to prevent leakage of lubricant, oil and grease or hazardous chemical to the soil or nearby water body.
Noise and Vibration		
<ul style="list-style-type: none"> ○ Exposure of excessive noise and vibration can cause: <ul style="list-style-type: none"> ✓ Hearing issues ✓ Sleeping disorder ✓ Cardiovascular issues ✓ Trouble in communication ✓ Impairment of vision or balance ✓ Motion sickness 	<ul style="list-style-type: none"> ○ Using heavy equipment and machineries. ○ Construction and decommission activities ○ Poorly designed or maintained vehicles or machinery during construction and decommission activities 	<ul style="list-style-type: none"> ○ Use equipment and machines which generate low noise levels. ○ Regular maintenance and inspection of all vehicles and equipment should be carried out to minimize the generation of noise and vibration. ○ Change vehicle types and driving habits can affect the intensity of exposure to noise. ○ Working hours should be restricted for workers particularly certain loud and vibrate activities such as pilling and drilling. ○ Driving behaviors such as over-revving or tire squealing that intentionally increase noise should be prohibited for drivers.

Potential Impacts	Source	Mitigation Measures
✓ Muscle and joint damage		<ul style="list-style-type: none"> ○ Uneven driving such as frequent acceleration or deceleration of speed can result in increase in noise emissions. ○ Provide adequate ear protection (ear plugs or muffs) to workers who work in the excessive noise areas. ○ Noise and vibration isolation pas should be used in machinery and equipment where necessary. ○ Install a non-vibrating products or tools. ○ Proper and regular maintenance of all vehicles and machinery. ○ Limit the amount of time of a worker or frequent breaks from exposure of vibration.
Health and Safety		
Occupational Health and Safety <ul style="list-style-type: none"> ○ Heat stroke and heat exhaustion ○ Hypotension ○ Vomiting ○ Heavy sweating ○ Faintness ○ Dizziness ○ Fatigue ○ Weak, rapid pulse ○ Low blood pressure upon standing ○ Muscle cramps ○ Nausea ○ Headache 	<ul style="list-style-type: none"> ○ Construction and decommission activities 	<ul style="list-style-type: none"> ○ Insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields should be provided. ○ Rotating job functions and incorporate work/rest cycles among workers can help minimize to heat exposure. ○ Workers should have an emergency response plan in place if a work suffer heat-related illness. ○ Workers must have adequate potable (safe for drinking) water close to the working areas and should drink water frequently.
Accidents	<ul style="list-style-type: none"> ○ Slip and fall ○ Bumping ○ Use of heavy vehicle 	<ul style="list-style-type: none"> ○ Clean working area regularly. ○ Warning signs should be set around spills or wet floors and avoid walking on slippery floors as much as possible.

Potential Impacts	Source	Mitigation Measures
<ul style="list-style-type: none"> ○ Accidents such as personal injury, moving vehicle and machinery 	<ul style="list-style-type: none"> ○ Moving parts of machinery 	<ul style="list-style-type: none"> ○ Use non-slip footwear. ○ Illegal drugs or alcohol must be prohibited at any time on working hours. ○ Workers who are taking prescription medication that may affect their safety at work should inform to the supervisor to assign appropriate duties. ○ Provide all workers for construction site with PPE. ○ Provide First Aid Kits sufficiently at the construction area and coordinated with nearby hospital for admission in case of accidents. ○ Restricted to use mobile phone while driving a motor vehicle or equipment. ○ Wearing seat belts while operating a moving vehicle. ○ Firefighting equipment and portable fire extinguishers shall be properly provided in construction area.
<p><i>Spread of infectious disease</i></p> <p>Malaria, Dengue, Tuberculosis, Hepatitis, HIV/AIDS, Cholera, etc.</p>	<ul style="list-style-type: none"> ○ Direct contact of person to person, animal to person ○ Insect bites ○ Food contamination ○ Poor personal hygiene practices ○ Poor cleanliness in the workplace 	<ul style="list-style-type: none"> ○ Wash the hands thoroughly with water and soap after visiting the toilet, preparing food, and after touching equipment. ○ Any cuts or abrasions should be covered with a waterproof dressing. ○ Do not share personal items such as towels, clothing, razors, toothbrushes, and shavers among workers. ○ Regularly wash the floors, bathrooms and surfaces with hot water and detergent. ○ Health impact training for workers about waste handling. ○ Stay at home if workers have signs and symptoms of an infection. ○ Practice about good personal hygiene for workers. ○ Environmental and health related education programs should be provided to raise awareness.

5.6. MITIGATION MEASURES TO BE TAKEN DURING OPERATION PHASE

Project proponent shall take all these mitigation measures. Operation phase potential impacts and mitigation measures for air pollution, solid waste, wastewater, noise and vibration, and health and safety are presented in Table 5-6.

Table 5-6 Environmental Impacts and Mitigation Measures during Operation Phase

Potential Impacts	Source	Mitigation Measures
Air Pollution		
<ul style="list-style-type: none"> ○ Air pollution ○ Respiratory tract infection (e.g. asthma) ○ Eye irritation ○ Shortness of breath ○ Decrease visibility 	<ul style="list-style-type: none"> ○ Fugitive gases from process equipment ○ Vehicles and machinery used for transportation and related production process ○ Biogas emission from wastewater treatment plant 	<ul style="list-style-type: none"> ○ Install sufficient ventilation/fume hoods must be used in places where exposures can be excessive ○ Regular maintenance for boiler operation controls. ○ Install sufficient exhaust stack. ○ Install air filter in the boiler smoke stack. ○ Use vacuum cleaner for cleaning the work places. ○ Turn off equipment when not in use. ○ Proper ventilation for generator house. ○ Regular maintenance of equipment and machines. ○ Provide enough PPE to employees. ○ Use biogas as a fuel source for Factory.
Solid Waste		
<ul style="list-style-type: none"> ○ Solid waste ○ Related health impacts for community ○ Soil contamination from solid waste leakage 	<ul style="list-style-type: none"> ○ Solid wastes such as spent grain from processing process and sludge from WWTP (Acronym?). ○ Domestic solid waste from both processing process and employees such as food waste, plastic, paper, glass, metal cans, sanitary napkins, tissue paper, garden waste, etc. ○ Hazardous waste from used chemical and sludge from caustic recovery tank. 	<ul style="list-style-type: none"> ○ Segregate solid waste at source by types of waste and systematically disposed into separate containers. ○ Apply 3R approach (reuse, refuse, recycle) as much as possible. ○ Recycle some solid wastes such as paper and cans. Moreover, apply broken glass as a source of raw material for glass production factory. Spent grain can use for animal farmland whereas sludge can apply for recreation purposes. ○ Use marked bins to segregate hazardous and non-hazardous wastes. ○ Hazardous waste and sludge from caustic recovery tank should be hand overed to the hazardous waste treatment company or

Potential Impacts	Source	Mitigation Measures
		directly transferred to the hazardous waste treatment department of city development communities.
Wastewater		
<ul style="list-style-type: none"> ○ Wastewater ○ Soil and ground water contamination from improper effluent discharge 	<ul style="list-style-type: none"> ○ Wastewater from brewery production process. ○ Domestic wastewater from employees' sanitation facilities such as toilets, showers, and kitchen sinks, laundries as well as septic tank ○ Storm water runoff from roofs, roads, paths into drains after raining. 	<ul style="list-style-type: none"> ○ Install wastewater treatment plant and regular monitoring for effluent discharge. ○ Install septic tank and regularly check the septic tank to avoid leakage of sewage. ○ Install and separate the drainage and pipeline system for processing wastewater line, sewer line and surface runoff. ○ It is essential to store a certain amount of absorbable material like sand to prevent leakage of lubricant, oil and grease or hazardous chemical to the soil or nearby water body.
Noise and Vibration		
<ul style="list-style-type: none"> ○ Exposure of excessive noise ○ Irritability ○ Tiredness or nervousness ○ Interference in concentration ○ Increase in incidence of accidents ○ Long term ill health ○ Increase habitat damage 	<ul style="list-style-type: none"> ○ Operating machinery and equipment especially from grilling machine ○ Poor design and construction 	<ul style="list-style-type: none"> ○ Use equipment and machines which generate low noise levels. ○ Reducing the volume of the sources by periodic maintenance by covering, period cleaning, lubricating machinery, aligning moving parts. ○ Creating barriers, using sound-absorbing materials wall to prevent and reduce reflection. ○ Provide adequate ear protection (ear plugs or muffs) to workers working in the excessive noise areas. ○ Use properly designed machines and production process to reduced vibration.
Health and Safety		
<ul style="list-style-type: none"> ○ Fire hazard ○ Flammable and explosive chemicals ○ Improper wiring system 	<ul style="list-style-type: none"> ○ Operation area 	<ul style="list-style-type: none"> ○ The factory designates the emergency response team and receives training in fire prevention, use of fire equipment, first aid and emergency medical rescue. ○ The employees receive basic firefighting from a local firefighting authority. ○ Draw up a plan for emergency response and procedures

Potential Impacts	Source	Mitigation Measures
		<ul style="list-style-type: none"> ○ Provide adequate PPE, provision of firefighting equipment, install lighting rods and arresters ○ Display warning signs, addresses/phone numbers of Fire Brigade, Ambulance service, Hospital, Police Station, etc. ○ Educate workers for safety awareness in work place.
Disaster Management		
○ Flood		<ul style="list-style-type: none"> ○ Project area is elevated enough to protect the flooding during monsoon season. ○ Proper drainage system should be managed to protect flooding condition. ○ Emergency response team should be trained to evacuate during flooding condition. ○ Install the barriers around the factory to prevent flood.
Occupational Health and Safety		
○ Occupational health and safety		<ul style="list-style-type: none"> ○ Create safety condition for work places ○ Educate and train workers for good working practice, good safety practice and good house-keeping practice ○ Prevent and avoid accidents at work places ○ Provide sufficient PPE for the employees. ○ Use eye protection and impermeable gloves as protective equipment while handling the hazardous materials. ○ Educate and train them for health education and workers in First Aid training ○ Provide first aid box with medicines and drugs comprising anti-malaria, anti-cholera and anti-toxicant. ○ The workplace must be hygiene with adequate facilities provided for cleaning food, utensils and equipment. ○ It is essential to store a certain amount of absorbable material like sand to prevent leakage of lubricant, oil and grease or hazardous chemical to the soil or nearby water body. ○ Employees who are directly involved in the production process should not work while affected by infectious diseases.

Potential Impacts	Source	Mitigation Measures
		<ul style="list-style-type: none"> ○ Factory shall have a dispensary run by a certified nurse. ○ Conduct annual medical checkup for current staffs. ○ A qualified medical doctor or nurse shall be appointed to perform medical checkups. ○ Reporting of occupational incidents.
Offensive Odor		
<ul style="list-style-type: none"> ○ Odors can sometimes cause health problems such as headaches, nausea and vomiting. 	<ul style="list-style-type: none"> ○ Brewery production process especially from fermentation ○ Offensive odor may also release from wastewater treatment plant especially from sludge management process 	<ul style="list-style-type: none"> ○ Install proper ventilation system within the factory ○ Provide sufficient PPE for the employees (e.g. masks) ○ Provide proper covering systems for offensive odor releasing sources.

CHAPTER 6

PUBLIC CONSULTATION

The main objective of public consultation is to provide project information, production procedures, waste management and potential environmental impacts to the regulators, authorities and stakeholders. During the public consultation, Myanmar Carlsberg and TBS (consultant) presented the project background, operation processes, environmental conditions, summary of impacts assessment and proposed mitigation measures. Suggestions and comments from the regulators, authorities and stakeholders were collected in the EMP report. The public consultation held at 15, June, 2022 at Myanmar Carlsberg factory. The details of the public consultation presented below and summary table of attendance sheets, received invitation list and presentation slide are included in **APPENDIX H**.

6.1. OBJECTIVE OF PUBLIC CONSULTATION

Public consultation meeting is regarded as a necessary part of the EMP study. Myanmar Carlsberg and its consultants have to organize a public consultation meeting among regulators, local community, local authority and other relevant organizations on the project development and plans. As a part of EMP requirement, Myanmar Carlsberg publicized about the project developments to the concerned stakeholders as follows;

- Information of the stakeholders about the project, environmental and social issues related to project operation, and mitigation measures to minimize environmental and social impacts.
- Considering the views, concerns, and perceptions of stakeholders, communities and individuals that could be affected by the project or who otherwise have an interest in the project.
- Participation and partnership where issues are needed to join for discussing and assess.

6.2. APPROACH TO PUBLIC MEETING

The approach to the public meeting was adopted as below:

- TBS coordinated with Myanmar Carlsberg to inform and consult about the date and venue of the public consultation meeting.
- TBS prepared and issued the invitation letter for the public consultation meeting.
- Myanmar Carlsberg sent the invitation letter to the relevant government sectors, identified stakeholders and nearby factories on the second week of June, 2022; from 6th to 10th June, 2022.
- Informed to all of the concerned stakeholders 7 days prior to EMP study of public consultation meeting.
- The Power Point presentation for EMP study of Myanmar Carlsberg presentation slides of beer manufacturing factory are written in Myanmar language. Further elaboration are focused on environmental monitoring and mitigation measures.
- The meeting was opened for discussion of Myanmar Carlsberg and TBS consultants were responsible for answering questions from the participants and

addressing public concern raised in the meeting regarding the project development plan.

- Public Consultation for EMP report was conducted on 15, June, 2022 by following the EMP procedure. The methodology and approach of public consultation meeting is presented below.

6.3. PUBLIC ANNOUNCE

Regarding the public announcement, all the information related to the public consultation and public disclosure of the proposed EMP project is announced on the official notice board of the Myanmar Carlsberg. In addition, all information related to the project is also updated on the private social media pages of the company. Finally, it is also planned to access the full EMP documentation to the public through company website pages.

6.4. SUMMARY OF PUBLIC CONSULTATION

Public consultation conducted on 15, June, 2022 at Myanmar Carlsberg factory from 10:00 am to 11:30 am. The participants in the public consultation were the project proponent, TBS (consultant performing the EMP study), Environmental Conservation Department (Bago), Social Security Board (Bago), City Development Committee (Bago) and local people. Agenda of the public consultation meeting is shown in Table 6-1.

Table 6-1 Agenda of the Public Consultation Meeting

No	Activity	Time
1	Registration	10:00-10:10
2	Opening Speech	10:10-10:15
3	Introduction Speech from Myanmar Carlsberg Co., Ltd	10:15-10:30
4	Power Point Presentation of project description, existing environmental conditions, potential impacts, mitigation measures and environmental management plan	10:30-11:00
5	Discussion time – comments and suggestion by the concerned stakeholders	11:00-11:30

Public consultation was started with the presentation about the project, followed by questions, answers and discussion. Ms. Aye Mon Aung (Environmental Engineer) from TBS performed as a master of ceremonies (MC) at public consultation. Furthermore, introduction speech was opened by Mr.Than Zaw (Factory Manager) from Myanmar Carlsberg Co., Ltd explained about their company profile. He explained how their factory manufactures the products, which countries they export, how they manage the employees of the factory under labor law and their operation procedure of the factory. Myanmar Carlsberg requested TBS (Consulting Firms) for the EMP for its factory.

Ms. Phoo Pwint Khine (Environmental Engineer) of TBS explained about the EMP requirements for the project. Questions and answers section followed after the TBS presentation. The details of the meeting including the meeting time, date, name of participants who attended the meeting is shown in Table 6-2. The attended sheet of the meeting and power point presentation slides are also attached in **APPENDIX H**.

Table 6-2 Meeting Context

Meeting Date		15 th June, 2022	
Meeting Time		10:00 AM – 11:30 PM	
Place		Myanmar Carlsberg Factory	
Government authorities (Total of 5 People)			
No	Name	Position	Organization
1	Ms. Ei Shwe Sin Moe	Staff Officer	Environmental Conservation Department
2	Ms. Theint Kyi Pyar Swe	Deputy Staff Officer	Environmental Conservation Department
3	Mr.Than Htun	Deputy Staff Officer	City Development Committee
4	Ms. Hla Nandar Moe	Staff Officer	Social Security Board
5	Ms. Aye Win	Deputy Staff Officer	Social Security Board
Project Proponent and Stakeholders (Total of 21 Persons)			
1	Mr.Than Zaw	Factory Manager	Myanmar Carlsberg
2	Mr. Wai Soe	General Manager	TBS
3	Mr. Htet Thiha Hpone Myint	Environmental Geologist	TBS
4	Ms. Aye Mon Aung	Environmental Engineer	TBS
5	Ms. Phoo Pwint Khine	Environmental Engineer	TBS
6	Ms. Kyi Phyu Khin	HR Leader	TBS
7	Ms. Thae Pwint Phyu	HR Manager	PCG Co.,Ltd.
8	Mr. Aung Min Khant	HR Assistant	New Hope Farms Co.,Ltd.
9	Mr. Tun Tun Myint	HR Manager	Karisma Apparel (M) Co.,Ltd.
10	Ms. Phyu Thin Khaing	HR Leader	Karisma Apparel (M) Co.,Ltd.
11	Mr. Tun Kyaw	Villager	Nyaung Inn Village
12	Mr. Zin Thet		
13	Mr. Soe Naing		
14	Mr. Zin Min Naing		
15	Mr. Aung Hla	Seasonal Worker	
16	Mr. Tun Tun		
17	Mr. Than Naing Win		
18	Mr. Soe Htite		
19	Mr. Khin Zaw	Construction Worker	
20	Mr. Aung Kyaw Moe		
21	Mr. Htay Aung		

6.5. DISCUSSING AND FEEDBACKS RECEIVED FROM MEETING

After the presentation, discussion section was started for questions and answers. Most of questions were about project planning and environmental issues. Photos of PCM activities are shown in Figure 6-1 and Figure 6-2. Table 6-3 shows all detailed discussion and feedbacks received from public consultation meeting.






Figure 6-1 Photos of PCM Activities



Figure 6-2 Photos of Participants from PCM Activities

Table 6-3 Discussion and Feedbacks Received from Meeting

Suggestion	Photo
<p>By Ms. Ei Shwe Sin Moe (Staff Officer): Environmental Conservation Department, Bago</p> <p>Suggestions:</p> <p>To arrange and manage the environmental management plan especially air pollution to control the standard emission level.</p> <p>To revise the EMP report according to the ECD comments and submit it on time.</p> <p>To add the location map of environmental quality monitoring points.</p> <p>To add the real time wastewater online monitoring results in the revised EMP report.</p> <p>To discharge the wastewater in comply with the guideline values.</p> <p>Answer by Ms. Phoo Pwint Khine (Environmental Engineer) from Total Business Solution Co., Ltd (TBS)</p> <p>Yes, we, the consultant team, will edit the revised report according to the ECD comments and suggestions.</p> <p>By Ms. Ei Shwe Sin Moe (Staff Officer): Environmental Conservation Department, Bago</p> <p>Questions:</p> <p>Although the guideline values of CO₂ is within the limit, emission rate is closed to maximum allowable guideline values. How to reduce CO₂ emission level in case it is exceed the limitation?</p> <p>How to reduce the exceeded temperature level in some areas?</p> <p>How to manage the sludge from wastewater treatment plant?</p> <p>Answer by Mr. Than Zaw (Factory Manager) from Myanmar Carlsberg Co., Ltd</p> <p>For CO₂ emission, we are planning to reduce a significant level of CO₂ emission from the factory. Currently, the main sources of CO₂ emission from factory are the boiler and electric power cable. Therefore, it has been installed the air filter at the outlet of the boiler chamney. In addition, it is planing to replace eco-friendly power cable for the whole factory gradually.</p> <p>Regarding the exceed temperature in the boiler room and production area, it has been installed the proper ventilation system in these areas to reduce the room</p>	 <p>Ms. Ei Shwe Sin Moe (Staff Officer): Environmental Conservation Department, Bago</p>  <p>Ms. Phoo Pwint Khine (Environmental Engineer) from Total Business Solution Co., Ltd (TBS)</p>  <p>Mr. Than Zaw (Factory Manager) from Myanmar Carlsberg Co., Ltd</p>

Suggestion	Photo
<p>temperature. Besides, it is also manage to control the process in these area from the control room as much as possible. As a result, it will reduce the working hours for the workers in these area.</p> <p>Regarding the sludge disposal system, there are two types of sludge from the wastewater treatment plant; namely, sludge from aerobic and anaerobic tanks. Generally, anaerobic sludge (18 to 20 tons) is collected every five year and sell it to the farmland. At the same time, aerobic sludge is collected weekly. During the rainy season, aerobic sludge is disposed within the project compound for land filling while it is also given to the local farmer in the summer.</p>	
<p>By Ms. Thae Pwint Phyu (HR Manager): PCG Co., Ltd</p> <p>Questions:</p> <p>As PCG Co., Ltd, has some issue in wastewater treatment process. Currently we are using lagoon based treatment system. Could you please provide some suggestion for our company?</p> <p>Answer by Mr. Than Zaw (Factory Manager) from Myanmar Carlsberg Co., Ltd</p> <p>In general, it is also essential to check whether the biological activities of the treatment plant is good or not by testing the inlet and outlet wastewater quality. Some nutrient for bacteria should be added if require. It is also important to control the temperature and pH values of the treatment plant depend on the situation. As both of our companies apply the biological wastewater treatment process, we can provide wastewater bacteria for your company if it is necessary.</p>	 <p>By Ms. Thae Pwint Phyu (HR Manager): PCG Co., Ltd</p>
<p>By local people (Nyaung Inn Village)</p> <p>Suggestions:</p> <p>Although local people haven't provide any suggestion, most of them appricate that they got many job apportunities because of the proposed project.</p>	 <p>By local people (Nyaung Inn Village)</p>

Total 26 participants attended the public consultation followed by describing in percentage, 19 % which represented the government authorities, 23 % which represented Myanmar Carlsberg and 58 % which represented the nearby local community as shown in Table 6-4.

Table 6-4 Percentage of Participants and Attendance of Public Consultation

Community	Number of participants	Total percentage
Government authorities	5	19 %
Project proponent (Myanmar Carlsberg)	6	23 %
Nearby community	15	58%
Total	26	100 %

6.6. ACTION TAKEN BY FACTORY AND FUTURE PLANS

Proposed project will take the action for most of the suggestions and comments from the public consultation meeting. Moreover, all the mitigation measures described earlier will duly implement by the factory.

CHAPTER 7

ENVIRONMENTAL MANAGEMENT ACTION

7.1. INTRODUCTION

This chapter presents the Environmental Management Plan (EMP) of brewery production factory. This EMP provides the procedures and processes, which will be applied to the project production activities to check and monitor compliance and effectiveness of the mitigation measure to the Myanmar Carlsberg has committed. In addition, this EMP is used to ensure compliance with statutory requirement and corporate safety and environmental policies.

7.2. SCOPE OF THE ENVIRONMENTAL MANAGEMENT

The objective of the environmental management is to ensure potential environmental issues managed by proper mitigation measures in compliance with the relevant laws and regulations stipulated by national authorities. Environmental management based on the basic principles of management is known as the P.D.C. A cycle (see Figure 7-1). Environmental management consists of four related tasks as described below:

- **Plan (P) - What need to be done**

Mitigation measures for the potential environmental impacts of the factory such as air emission, noise, solid waste, wastewater and health and safety at work were described in this chapter. The Project proponent will follow the plan for the mitigation measures according to the scheduled time.

- **Do (D) - Implement the plan**

The Project proponent as described in this chapter will implement the mitigation measures for the potential environmental impacts appropriately.

- **Check (C) - Monitor and evaluate the results of implementation**

The effectiveness of the mitigation measures will be monitored, evaluated and documented.

- **Act (A) - Taking corrective actions to improve the results, if found inadequate**

If nonconformities noted with reference to the environmental monitoring benchmarks, corrective actions are needed to plan for mitigating the existing environmental impacts.

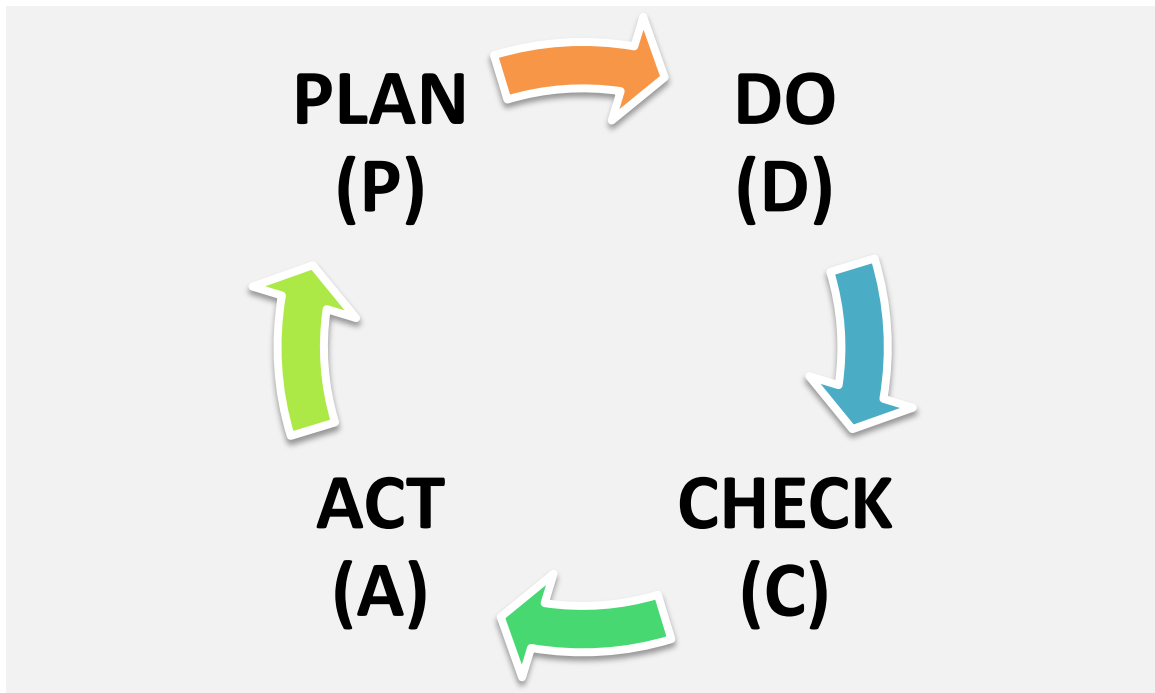


Figure 7-1 P. D. C. A Cycle

7.3. INSTITUTIONAL REQUIREMENT

Myanmar Carlsberg will manage the development of the proposed Project. The Project proponent should appoint Health, Safety and Environment (HSE) team throughout the duration of the Project phases. HSE team is responsible for implementation and monitoring of Environmental Management Plan (EMP) and Monitoring Plan as well as coordination with local authorities and the nearby communities. The HSE team also makes regular review of EMP to cover all potential impacts, amendments and modifications. Organization chart responsibilities for EMP is shown in Figure 7-2.

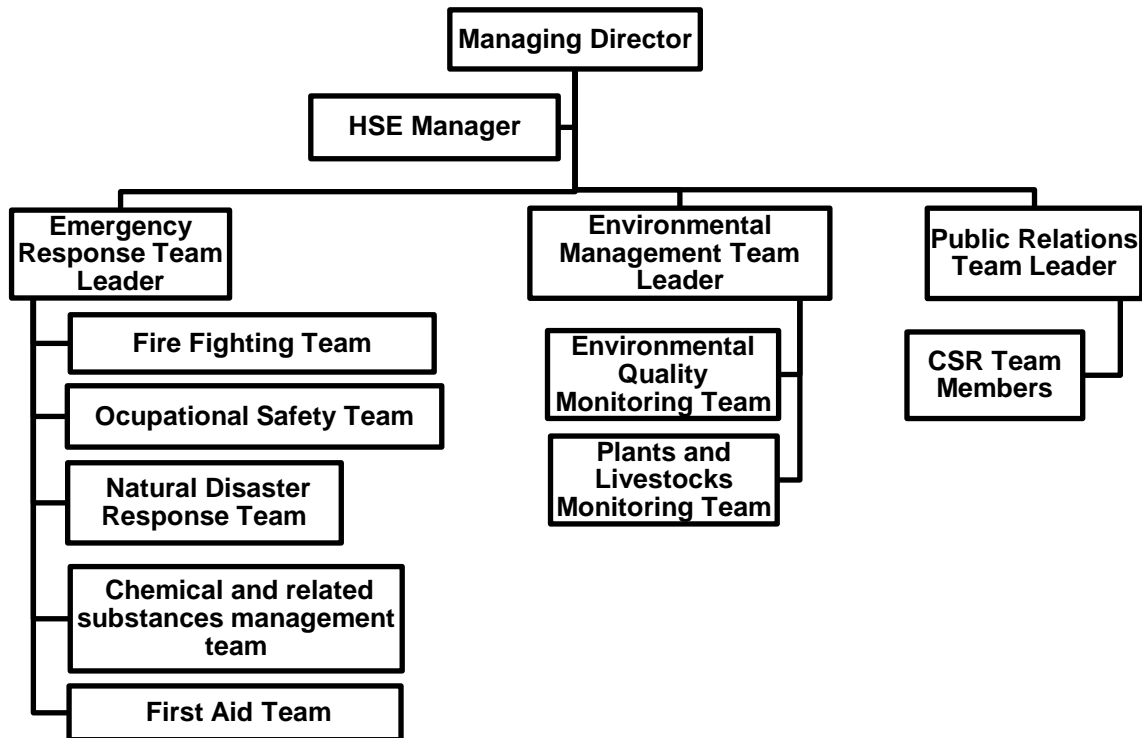


Figure 7-2 Organization Chart Responsibilities for EMP

7.3.1. Responsibilities

In order to ensure the sound development and effective implementation of the EMP, it will be necessary to identify and define the responsibilities. The environmental management practices, procedures, and responsibilities are defined herein to get full compliance with the existing environmental policy, laws, rules and regulations of the Republic of the Union of Myanmar. Roles and responsibilities of each members from EMP team is shown in Table 7-1.

Table 7-1 Roles and Responsibilities

Roles	Responsibilities
Managing Director	<ul style="list-style-type: none"> • Provide resources to establish, implement, maintain and improve the Environmental Management System including occupational health and safety environmental management, emergency response, environmental management and public relations • Assign an Environmental Management System management representative • Manage and review environmental documents
HSE Manager	<ul style="list-style-type: none"> • Responsible for health, safety and environmental compliance at project site area. • Ensure the existing processes and projects are in compliance with environmental conservation laws and regulations • Provides an environmental health and safety program including hazard identification, evaluation and control, accident prevention, hazardous

Roles	Responsibilities
	waste management, emergency preparedness, fire/life safety, ergonomics, industrial hygiene, and environmental regulatory compliance.
Emergency Response Team Leader	<ul style="list-style-type: none"> Establish the teams to deal with emergency conditions involving with fire hazard, occupational safety, natural disasters, hazardous waste management and accident Develop the training program to the team members to handle various types of emergencies and disasters
Environmental Management Team Leader	<ul style="list-style-type: none"> Implement environmental policies and practices Manage environmental strategy budgets Provide environmental training to staff at all levels and write plans and reports Ensure compliance with environmental legislation Assess, analyze and collate environmental performance data and report the information to internal staff, clients and regulatory bodies
Public Relation Team Leader	<ul style="list-style-type: none"> Coordinate all public relation activities Develop a media relations strategy, seeking high-level placements in print, broadcast and online media Lead social media team to engage audiences across traditional and new media Manage media inquiries and interview requests

7.4. FACTORY CLINIC

Workers can injure due to falling on slippery floors and improper use of machine and tools. Food-borne diseases like diarrhea, food poisoning and seasonal diseases such as influenza (Flu) and Dengue fever may be occurred among the workers. Factory create ideal conditions for transmission of infectious diseases.

It is required to provide clean and healthy facilities such as hygienic eating areas, ventilated working areas and clean latrines etc. First aid service should be provided under the medical officer in charge and nursing staff. Workers should be provided yearly medical check-up for their health and safety. It is also required to draw up emergency response plan, nearest hospital location maps and phone numbers of fire department, administrative offices and nearby hospitals and clinics.

7.5. FACTORY MANAGEMENT PLAN

7.5.1. Wastewater Management

All the wastewater from both brewery processing process and domestic wastewater from employees' facilities are treated in own wastewater treatment plant of the factory.

- Wastewater Treatment System

Generally, domestic wastewater from employees' facilities is treated in the septic tank first while the effluent from septic tank is transferred into wastewater treatment plant through the sewerage pipeline. Regarding factory processing process, all the wastewater

from the brewery production process are transferred to the factory WWTP that is a sequential process of treating contaminants in wastewater. Biological wastewater treatment system, a combination of anaerobic and aerobic process, is used to treat the wastewater. The capacity of wastewater treatment plant is 1,000 m³/d. The detailed wastewater treatment process is also mentioned in chapter 3, project utilities section.

- **Real Time Wastewater Online Monitoring System**

Normally, treated water from WWTP is discharged into nearby waterbody while a certain amount of treated water is used for gardening purposes. The quality of effluent discharge shall meet the standard of National Environmental Quality Emission Guidelines (NEQEG). In addition, it is also installed the real time wastewater online monitoring system to measure the wastewater quality for 24 hours. The monitoring results from real time online monitoring system are shown in chapter 4, baseline environmental quality section.

- **Sludge Management System**

At the same time, by-product of WWTP, sludge sumps are treated through the sludge management process. After the final collection process, the sludge and scum from the wastewater treatment process is dewatered by belt pressure. In general, anaerobic tank produces around 20 tons of sludge every five year and deliver it for gardening or agricultural purposes. Meanwhile, sludge from aerobic tank is used for land filling process within the factory in rainy season. Aerobic sludge is also deliver to the local farmers for agricultural pruposes. Biogas emission from WWTP is also planned to use as one of the fuel sources for boiler.

7.5.2. Solid Waste Management

Waste generated at the factory is managed carefully and temporary garbage bins are provided in the factory compound. Firstly, solid wastes from all departments are segregated into five categories and collected at temporary trust bins. These five categories of solid wastes are as follows.

1. General and biodegrade or
2. non-biodegrade wastes
3. Recyclable wastes
4. Broken glass
5. Hazardous wastes and sludge from caustic recovery tank
6. Spent grain, sludge from wastewater treatment plant

General and biodegrade or non-biodegrade wastes as well as recycle or to be sold wastes are transferred from temporary bins to plastic bags before throwing to concerned waste disposal area. At the same time, broken glass is also collected with the 200 L plastic containers. When the containers are full, these containers are put in the waste disposal area in which containers containing broken glass are put on the wooden pallets. Regarding hazardous wastes, these wastes are stored at the temporary hazardous waste disposal area by labelling hazardous waste symbols on it.

After that, all these hazardous waste and sludge from caustic recovery tank are disposed by following the laws and regulations of the Prevention of Hazard from Chemical and Related Substances. The chemical registering certificate of Myanmar Carlsberg is also attached in the **APPENDIX I**. Spent grain is directly collected from the contracted supplier while sludge from wastewater treatment plant is used for recreation purposes within the Factory. Detail waste collection and separation procedures of the factory are shown in Figure 7-3. The estimation of produced waste per mmonth is also described in Table 7-2.

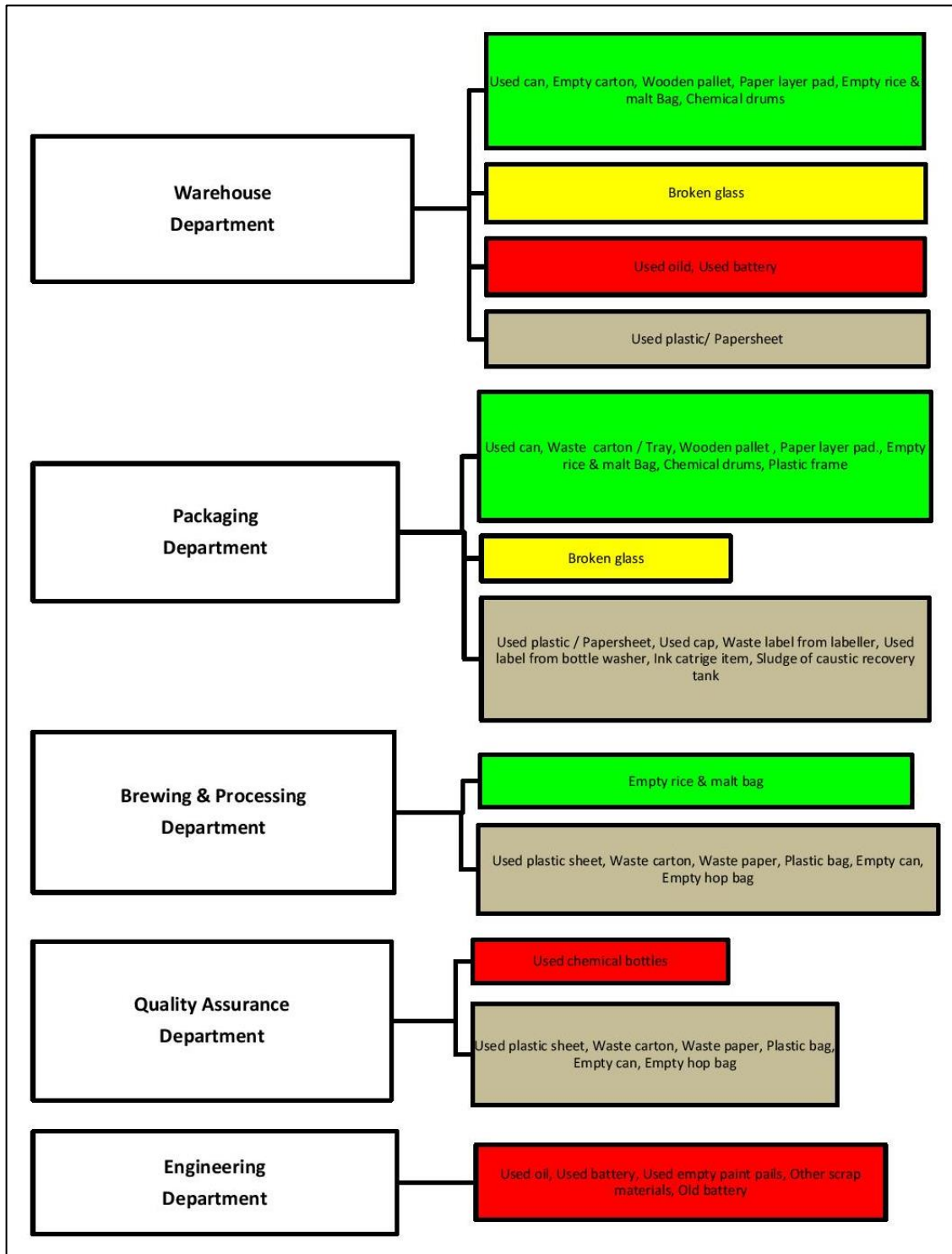


Figure 7-3 Detail Waste Collection and Separation Procedures

Table 7-2 Estimation of Produced Waste per Month

No.	Waste	Buffer area needed or not	Preparation	Safety alert	Responsible person
1.	Recyclable Waste (Recyclable Waste) 1.Used Can 2.Empty Carton 3.Wooden pallet/Frame 4.Paper layer pad. 5. Empty PP rice / malt Bag 6.Chemical Drums	Send to temporary waste disposal area directly	No special preparation	1.Cut resistance gloves 2.Safety shoes	Chemical and Related Substances Management Team
2	Broken glass	Collect with 200 lit Plastic bin at work area	Collect with 200 lit Plastic bin and place on wooden pallet	1.Eye protection 2.Cut resistance gloves 3.Safety shoes	Chemical and Related Substances Management Team
3.	General Waste (Bio/Non-Biodegradable) 1.Used scrap plastic / Paper sheet 2.Used crown and cap 3.Waste label from labeler 4.Used label from bottle washer 5.Ink cartage item 6.General waste	Collect with 200 lit Plastic waste bin at work area	Collect all waste and put inside the plastic bag from 200 lit plastic waste bin	1.Cut resistance gloves 2.Safety shoes	Chemical and Related Substances Management Team
4.	Hazardous waste		All waste container must be sealed prior to any transport.	1.Eye protection 2.Cut resistance gloves 3.Safety shoes 4.Face mask or respiratory protection where required.	Chemical and Related Substances Management Team
4	Spent grain	No special preparation	-	Contracted supplier	
5	Waste water sludge	No special preparation	-	Environmental Quality Monitoring Team	
6.	Un-Schedule Waste	Upon received status	-	-	

The temporary waste disposal site especially for the hazardous waste, is constructed on the reinforce concrete slab in order to prevent the leakage form the waste. It is also provided the proper roof system for all waste storage tanks which are separated to each other by brick walls. The total area of hazardous waste disposal site is around

1,200 square-feet. The current condition of temporary waste disposal site and a photo of collected wastes are described in Figure 7-4 and Figure 7-5.



Figure 7-4 Temporary Waste Disposal Site

<p>Broken Glass</p>	<p>General Waste / Biodegradable/Non-Biodegradable</p>
<p>To be sold out materials (Dry paper / Used can body / Plastic bag / Rice bag / Malt bag)</p>	<p>Empty drums (Chemical +ingredients+ Hazardous waste)</p>

Figure 7-5 Waste Collection Site

In order to prevent fire, the project factory has to install fire detectors, alarm systems, sprinkler systems and provision of fire-fighting equipment based on the requirements of Myanmar's fire codes. Safety manager has to arrange fire-fighting training once a year and conduct fire drill monthly. Safety manager has to establish emergency exit in the factory compound with clear marking.

Safety manager has to provide access to emergency services of the nearby hospitals and direct communication link with local fire brigades and other relevant government authorities.

7.5.3. EMP for Good Working Practices and Good Safety Practices

The brewery factory shall follow, as practical as possible environmental health and safety standard and guidelines. The factory has own program for capacity building and training covering good working practices and good safety practices. The factory shall also follow EHS guidelines and international standards for the ecofriendly operation of factory.

7.6. RECORDING AND REPORTING

Keeping records and reporting are important management tools for ensuring sustainable operation.

There will be two types of monitoring reports after environmental monitoring and site inspection. The first type is for internal use to provide feedback to the environmental management system. Finally, annual review should be prepared and an annual environmental management report should be submitted to the MONREC/ECD every 6 month under the EIA procedure.

7.6.1. Internal Monitoring and Inspection Report

The EMP responsible cell members may conduct daily, weekly or monthly general inspections of the project area and facilities. The objectives are to identify non-compliances to EMP.

7.6.2. Incident, Accident and Emergency Report

In cases of incident and accident, prompt reporting has been carried out. This must be in the form of verbal reporting followed by written statement, after emergency and contingency procedures have been undertaken. The written statement should be more comprehensive and should be included the location and cause of accident, the time, extent and intensity and how actions for emergency and contingency procedures taken. Reporting on incidents may not be necessary; it is actually the duty of the security staff to take action.

7.6.3. Emergency Preparedness and Response Plan

The HR department responsible person may control the emergency response plan, which will be a part of the factory's Occupational Health, Safety and Environmental program (OHSE). Factory emergency respond plan should be included the following facts:

- Communication systems for worker notification and communication, community notification, media and agency relations

- Direct communication link with industrial or township fire brigades and other relevant government authorities
- Finance and emergency funds
- Medical services such as fully equipped first aid facilities
- Fire services such as fire-fighting equipment, fire-fighting water tank, and trained personnel.
- Contact list to access to emergency services of the nearby hospital
- Training all staff for workplace safety

Health and environmental management also play a major role in emergency response plan.

7.6.4. Reporting on Training Program

As mentioned earlier, there must be a regular monitoring and inspection of all training programs such as firefighting training, first aid training and training for quick response in case of emergency.

EMP cell members conducting monitoring and inspection works must be able to interpret and assess the overall condition of the training processes especially assessment of the effectiveness and applicability of each training.

A report on the training program including assessment on its effectiveness must be recorded and submitted at the end of each training program.

7.6.5. Training Programming for the Factory

There has own program for capacity building and training covering good working practices and good safety practices such as fire training, earthquake training and first aid training. Safety risk management for the factory is important. The Project proponent trained the workers under respective intelligent trainers.

7.7. MONITORING PROGRAM

Environmental monitoring plan is important for the effective execution and successful implementation of EMP. Environmental monitoring focuses on the work environment which includes waste management, health and safety of workers, safety of the facilities and also on the socio-economic component of the environment. The objectives of monitoring program are;

- To measure impacts that occurs during the operation phase of the project
- To ensure compliance with statutory requirements
- To determine the effectiveness of mitigation measures and other measures
- To assist in the implementation of EMP



7.7.1. Summary of Environmental Monitoring Program


The summary of environmental, health and safety monitoring program are shown in Table 7-3. In this table, not only the monitoring frequency of relevant parameters but also the estimated budget for each activity is also described.


The total estimated budget mentioned in the following table Table 7-3 will be adjusted depending on the actual condition of the project. In addition to monitoring plan, there should be auditing plan in the form of internal and external environmental audit. The audits will assess the environmental performance of the operation in complying with the environmental laws, rules and regulations.

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Table 7-3 Environmental, Health and Safety Monitoring Program

Monitoring item	Monitoring Parameter	Area to be Monitored	Frequency	Estimated Budget (MMK)	Responsible Team
Air quality	CO ₂ , CO, CH ₄ , NO ₂ , O ₃ , PM ₁₀ , PM _{2.5} , SO ₂ , VOCs	<p>One point at the project site (17° 15' 23.28" N and 96° 27' 14.13" E)</p> 	Twice a year during operation phase	2,000,000	Environmental Quality Monitoring Team
Noise	Noise level (dB(A) scale)	<p>One point at the project site (17° 15' 26.35" N and 96° 27' 14.38" E)</p> 	Twice a year during operation period	1,000,000	Environmental Quality Monitoring Team
Vibration	Radial, Transverse, Vertical	<p>One point at the project site (17° 15' 23.51" N and 96° 27' 14.30" E)</p>	Twice a year during operation period	1,000,000	Environmental Quality

Monitoring item	Monitoring Parameter	Area to be Monitored	Frequency	Estimated Budget (MMK)	Responsible Team
					Monitoring Team
Solid waste	Production waste, rejected products, packaging waste bags and containers Domestic refuse, paper and general office waste and domestic waste	Temporary Storage Sites of proposed factory	Annually	2,000,000	Environmental Quality Monitoring Team
Wastewater	BOD5, Antibiotics, COD, Oil and grease, pH, Temperature increase, Total coliform bacteria, Total nitrogen, Total phosphorus, TSS	Two point at the project site (17° 15' 24.77" N and 96° 27' 10.72" E for wastewater influent) and (17° 15' 22.86" N and 96° 27' 10.75" E for wastewater effluent)	Annually	1,000,000	Environmental Quality Monitoring Team

Monitoring item	Monitoring Parameter	Area to be Monitored	Frequency	Estimated Budget (MMK)	Responsible Team
					
Occupational Health and Safety	Incident/accident records	At the factory and production sector	Annually	5,000,000	Occupational Safety Team

7.8. ACTIVITIES TO BE DONE DURING PROJECT CLOSURE PHASE

Myanmar Carlsberg has prepared a closure plan to reduce environmental and social impacts caused by the beer production process with appropriate mitigation measures in an environmentally friendly manner. The procedure of the closure plan is as follows.

- Requirements of the local communities are taken into consideration to appropriate some extent.
- On site closure plan for each specific area and type of facility and structure on site.
- Testing program for assessment of physical and chemical stability of waste dump and leach materials.
- The closure plan updating procedure will involve various stakeholders' participation and consultation.
- During the closure phase, the transportation cars and excavators can spill the oil leakage. It is needed to test the soil quality. The project component will collaborate with the environmental associative organizations and plant the seasonal trees to remediate the soil layers.
- It is also planned to monitor the environmental quality including air, water, noise and vibration of the project area.
- Closure costs will be established simultaneous with the plan for closure and financial provision in order to make sure that sufficient funds are provided for final closure.

7.9. ORGANIZATION AND FUND FOR EMP

A small EMP cell consisting of 2-5 members has been formed; the factory manager should be an EMP cell leader. Other cell members will be consisting into technicians together with employees. If possible, some of these cell members should deploy for doing monitoring and inspection works effectively implement EMP.

The budget for EMP fund will cover the initial cost and recurring expenses for implementation EMP Table 7-4 shows annual budget allocation for proposed environmental, health and safety mitigation measures.

Table 7-4 Estimated Budget for Environmental, Health and Safety Mitigation Measurement

No	Proposed Environmental Mitigation Measures	Estimated Budget (MMK)
Environmental Work		
1	Monitoring program	7,000,000
2	Emergency case	500,000
3	Capacity building and training	500,000
Health and Safety Work		
4	Personal protective equipment	3,000,000
5	Medical support for clinic	500,000
6	Firefighting equipment	500,000

7.10. CORPORATE SOCIAL RESPONSIBILITY PROGRAM

The purposes of implementing copCSR program are to develop good relations between the public and project proponents as well as to promote high standard of living near the project area. Myanmar Carlsberg will provide CSR fund which is (2%) of the net profit to use in the following purposes.

- (a) To provide the support in education sector around Bago Region
- (b) To support the protection of the environment as well as from the fire around the Factory.
- (c) To develop the employees' skills.
- (d) To provide educational grand for the employees' children.
- (e) To provide the employees' health examination.
- (f) To donate the clothes to the local communities

7.10.1. CSR Implementation Team

There are three main components in the CSR Implementation Team. They are financial support team, management team and CSR program implementation team members. Propose CSR Implementation Team Structure is shown in Figure 7-6.

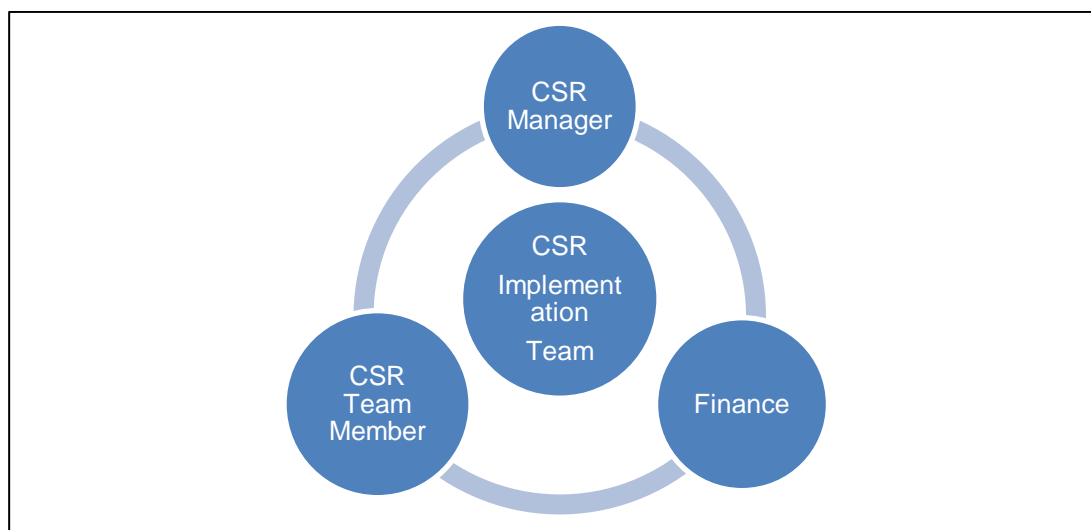


Figure 7-6 Propose CSR Implementation Team

7.10.1.1. CSR Manager

To become more efficient and affective CRS program, CSR Manager is required. The manager can be arranging the CSR program and can suggest to donate in required places. He may be check out the amount of using CSR fund that the factory really follows as their commitment.

7.10.1.2. Finance

Finance department require to management the fund of CSR.

7.10.1.3. CSR Team Member

All employees from the factory can be the member of CSR Team. Members can be participated in every CSR activity and can give advices to improve CSR activities. CSR Program of the Proposed Project is shown in Table 7-5.

Table 7-5 CSR Program of the Proposed Project

Item	Activities	Expected Budget	Objectives
Health	<p>Providing medical supplyment for staff and their families</p> <p>Providing the employees' health examination</p> <p>To support the protection of the environment as well as from the fire around the Factory</p>	1 %	To ensure that workers working in the workplace and their families are in good health
Education	<p>the awareness of Promoting education and human right</p> <p>Providing educational grand for the employee's children</p> <p>Providing the support in education sector around the project area</p>	0.5 %	<p>To become a better society</p> <p>To improve the education level of the workers' families</p> <p>To develop the skill of the employees</p>
Regional Development	<p>Doing donation clothes and money to local organizations and poor people nearby project area</p>	0.5 %	<p>To enable local charitable organizations to operate well,</p> <p>To enable employees to cooperate actively in the common work that is being done in the region,</p> <p>To avoid and understand human rights among workers</p> <p>To prevent sexual harassment and oppression in the workplaces</p>

CHAPTER 8

CONCLUSIONS

This EMP report has been prepared based on the provided information by project proponent, relevant studies and reports, baseline environmental monitoring and the public consultation.

The project is less likely to cause significant environmental and social impacts. Most of the impacts are temporary on the environment and these impacts can be mitigated to reduce to acceptable levels.

The project proponent has facilities and staffs to train and manage solid and liquid wastewater. This EMP report outlined potential environmental impacts during the operational phase of the factory. Those potential impacts could be mitigated if the above recommended mitigation measures are taken. The environmental monitoring team organized by the factory should take the responsibility of regular monitoring.

Myanmar Carlsberg shall be responsible for the preservation of the environment at and around the area of the project site. In addition to this, it shall carry out each instruction made by MONREC. In which to conduct an EMP that describes the measure to be taken for preventing, mitigation and monitoring significant environment impacts resulting from the implementation and operation of proposed project or business or activity has to be prepared and submitted to perform activities. In accordance with this EMP and be abided by the environment policy, Myanmar Carlsberg shall be responsible for environmental assessment of the factory as follows:

- Environmental management plan is well accomplished and strongly conducted.
- The plan is conducted by strictly following the instructed procedure and relevant rules and regulations.
- Myanmar Carlsberg will be complied completely and continuously the commitment in which the activities to reduce the environmental impact.
- During the operating period, the company will be carrying out the proposed environmental management plan to be better by applying updated technologies and system as well as depend on the workplace requirement according to the comments from ECD.
- The factory will conduct environmental and social management plan to avoid the impact to the local area before the closure.

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APPENDIX A

Roles of TBS Staff

No	Name	Position	Education	Experience	Responsibilities
1.	Dr. Soe Moe Kyaw Win	Managing Director Principal of Geotechnical and Geoenvironmental Engineer	Ph.D. (Geotechnical Engineering) M.Sc. (Geotechnical Engineering) B.Sc. (Geology)	25 years' experience in the areas of environmental assessment, geotechnical and geological engineering in Southeast Asian, U.S.A and Canada. Environmental assessments, mine waste management, site investigation, instrumentation, ground improvement, land reclamation and landslide investigation.	Final review of the report Geology and Soil Risk Assessment and Hazard Management Waste Management
2.	Ms. Hnin Lai Win	Environmental Manager	M.Sc. (Environmental Engineering and Management) B.Pharm. (Pharmacy)	5 years experiences in management and marketing and training of junior staff in medical field Over 2 years experiences in land use planning, environmental impact assessment and managing environmental projects. Environmental management plan, environmental monitoring, environmental risk assessment, facilitated the public consulting meetings, marketing, coordination with government organizations and local community.	Overall review of the report Pollution Control Environmental Impact and Mitigation Measures Facilitating of Meeting
3.	Ms. Su Myat Kyaw	Environmental Scientist	M.E (Environmental Engineering and Management) B.E (Materials and Metallurgy)	2 years experiences in environmental field Environmental impact assessment and management plan, environmental reporting,	Legal Analysis Air Pollution Control Facilitating of Meeting



No	Name	Position	Education	Experience	Responsibilities
				coordination with government offices and local community.	
4.	Mr. Htun Lin Kyaw	Survey Manager/ Assistant Environmental Manager	M.Sc (Structural Geology) B. Sc (Hons) Geology	3 years experience in topography, road and construction survey. 3 years experience in environmental management plan, managing environmental projects and environmental monitoring instruments installation. Air, noise monitoring, water sampling, land use observation, marketing, conducting public consultation meetings, coordination with government organizations and local community.	Environmental Quality Surveyor Occupation Health and Safety
5.	Ms. Thandar Kyaw	Environmental Geologist	M.Sc. (Petroleum Geology) B.Sc. (Hons)Geology	2 years experience in geotechnical laboratory testing and environmental management plan. Environmental survey, socio-economic survey, environmental impacts monitoring, conducting public consultation meetings, marketing, coordination with government organizations and local community and documentation in environmental management projects.	Environmental Management Plan Geology and Soil Facilitating of Meeting

No	Name	Position	Education	Experience	Responsibilities
6.	Ms. Phoo Pwint Khine	Environmental Engineer	M.E (Environmental Engineering and Management) B.E (Civil)	1 year experience as a site engineer in construction project. 6 months experience as a QC/QS at building estimate team.	Project Description Wastewater Management Hazardous Waste Management Environmental Management Plan
7.	Ms. Aye Mon Aung	Environmental Engineer	M.E (Environmental Engineering and Management) B.E (Materials and Metallurgy)	7 months experience as teacher guide for matriculation students Over 1 year experience as sale representative	Project Description Environmental Impact and Mitigation Measures Conclusion
6.	Ms. Eaindra Oo	Water Resources Engineer	M.Sc. (Water Engineering and Management) B.Sc. (Civil and Infrastructure Engineering)	2 years experience in Hydropower engineering, catchment and river management, flood monitoring, hydrology survey and modelling and climate condition study. Hydropower designing, planning and estimation. Geotechnical data processing, data analysis and report preparation. GIS mapping and reporting environmental management plan for environmental projects.	Water Resources Management Water Pollution Control
7.	Mr. Htet Thiha Phone Myint	Environmental Geologist	B.Sc. (Geology)	5 years experiences in geological field, soil analysis, environmental management land use observation	Monitoring , Environmental Quality and Surveying Surrounding Environment

No	Name	Position	Education	Experience	Responsibilities
				Environmental site survey, impacts monitoring (air, noise, water sampling), coordination with government organizations and local community, socioeconomic survey and documentation in environmental management projects.	
8.	Mr. Phyo Thu Kyaw	Auto CAD Drafter	B.E. (Mechatronic)	3 years experiences in project coordination, documentation, Auto CAD drafter and graphic design and IT technician. Over 2 years experiences in environmental monitoring such as air and noise monitoring, water sampling and installing, maintaining and repair of computer system and office equipment.	Coordinator and Drafter
9	Mr. Aung Chit Oe	Environmental Geologist	B.Sc. Hons (Geology)	over 1 year experience in geological and geotechnical engineering over 1 year experience in environmental field	Geotechnical GIS, Mapping and Data Processing
10.	Ms. May Khaing Zin Hein	Junior Engineer	B.E (Civil)	Data Processing for geostudio soil stability and starter logging, GIS Mapping, report comment editing	Mapping and Data Processing

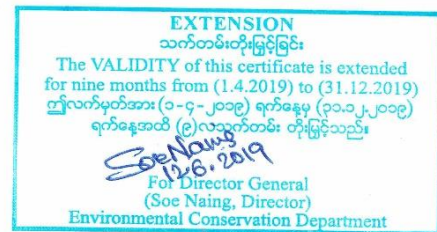
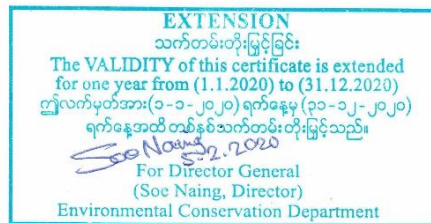
APPENDIX B

Certificate for Transitional Consultant Registration

		REPUBLIC OF THE UNION OF MYANMAR			
Ministry of Natural Resources and Environmental Conservation					
CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION					
(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)					
No. 0010		Date 10 th JUL 2017			
<p>The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.</p> <p>(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)</p>					
(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Total Business Solution Co., Ltd.			
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	Mr. Praneet Prasongnitjakit			
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Thai			
(d)	Identity Card /Passport Number of the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	Z 322340			
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No.54, Room No.704, Waizayantar Tower, Waizayantar Road, Thingangyun Township, Yangon. tbs.myanmar@gmail.com praneet.tbs@gmail.com , 09253556719			
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization			
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018			
<div><p>EXTENSION သက်တမ်းတိုးမြှင့်ခြင်း</p><p>The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019) ဤလက်မှတ်အား (၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁-၃-၂၀၁၉) ရက်နေ့အထိ တစ်နှစ်တိုးတင်၊ တိုးမြှင့်သည်။</p><p><i>See Naing</i> For Director General (Soe Naing, Director) Environmental Conservation Department</p></div>		<div><p><i>31-3-2018</i></p><p>Director General Environmental Conservation Department Ministry of Natural Resources and Environmental Conservation</p></div>			

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Air Pollution Control
2. Geology and Soil
3. Risk Assessment and Hazard Management
4. Socio-Economy
5. Water Pollution Control
6. Public Health
7. Safety and Health in Construction



APPENDIX C

Myanmar Carlsberg Certificates from Myanmar Investment Commission

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်
ခွင့်ပြုမိန့်



ခွင့်ပြုမိန့်အမှတ် ၅၅၇/၂၀၁၃

၂၀၁၃ ခုနှစ်၊ ဖေဖော်ဝါရီလ ၁၆ ရက်

ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု ဥပဒေ ပုဒ်မ (၁၃)ပုဒ်မခွဲ(ခ)
အရ ဤခွင့်ပြုမိန့်ကို မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်က ထုတ်ပေးလိုက်သည် -

- (က) ရင်းနှီးမြှုပ်နှံသူ/ကမကထပြုသူအမည် ဦးသန့်ဇင်ထွန်း
- (ခ) နိုင်ငံသား မြန်မာ
- (ဂ) နေရပ်လိပ်စာ အမှတ် ၅၂/ခ၊ ရွှေတောင်ကြားလမ်း၊ ရွှေတောင်ကြားရပ်ကွက်၊
ဗဟန်းမြို့နယ်၊ ရန်ကုန်မြို့
- (ဃ) ပင်မအဖွဲ့အစည်းအမည်နှင့်လိပ်စာ MGS BREWERIES COMPANY LIMITED,
၇/၈ ဗဟိုစည်အိမ်ယာ ဗိုလ်ချုပ်အောင်ဆန်းလမ်း၊ လမ်းမတော်မြို့နယ်၊ ရန်ကုန်မြို့၊
ရန်ကုန်တိုင်းဒေသကြီး
- (င) ဖွဲ့စည်းရာအရပ် မြန်မာနိုင်ငံ
- (စ) ရင်းနှီးမြှုပ်နှံသည့် လုပ်ငန်းအမျိုးအစား CARLSBERG ဘီယာ ထုတ်လုပ်ခြင်း နှင့်
ရောင်းချခြင်းလုပ်ငန်း
- (ဆ) ရင်းနှီးမြှုပ်နှံသည့်အရပ်ဒေသ(များ) မြေကွက်အမှတ် (၃)မှ(၁၃) ညောင်အင်းကျေးရွာ၊
ပြည်ပစက်မှုစီမံကိန်းနယ်မြေ၊ ပဲခူးမြို့နယ်၊ ပဲခူးတိုင်းဒေသကြီး
- (ဇ) နိုင်ငံခြားမတည်ငွေရင်း ပမာဏ အမေရိကန်ဒေါ်လာ ၁၈.၈၇ သန်း
- (ဈ) နိုင်ငံခြားမတည်ငွေရင်းယူဆောင်လာရမည့်ကာလ ကော်မရှင် ခွင့်ပြုမိန့် ရရှိပြီး
(၁)နှစ် အတွင်း
- (ည) စုစုပေါင်း မတည်ငွေရင်းပမာဏ(ကျပ်) အမေရိကန်ဒေါ်လာ ၃၇.၀၀ သန်းနှင့်
ညီမျှသော မြန်မာကျပ်ငွေ
- (ဋ) တည်ဆောက်မှုကာလ ၂ နှစ်
- (ဌ) ရင်းနှီးမြှုပ်နှံခွင့်ပြုသည့် သက်တမ်း ၅၀ နှစ်
- (ဍ) ရင်းနှီးမြှုပ်နှံမှုပုံစံ ဖက်စပ်လုပ်ငန်း
- (ဎ) မြန်မာနိုင်ငံတွင် ဖွဲ့စည်းမည့် စီးပွားရေး အဖွဲ့အစည်းအမည်
- MYANMAR CARLSBERG COMPANY LIMITED

ဥက္ကဋ္ဌ
မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်

APPENDIX D

Fire Drill Certificate



တိုင်း ဒေသ ကြီး မီး သတ် ဦး စီး မှူး ရုံး
ပဲခူး တိုင်း ဒေသ ကြီး - ပဲခူး မြို့
စာအမှတ်၊ ၆၃ / ၅၀ / ၃ / ဦး - ၂
ရက်စွဲ၊ ၂၀၁၇ ခုနှစ်၊ ဇူလိုင်လ ၁၀ ရက်

အကြောင်းအရာ။ ထောက်ခံချက်ပေးပို့ခြင်း

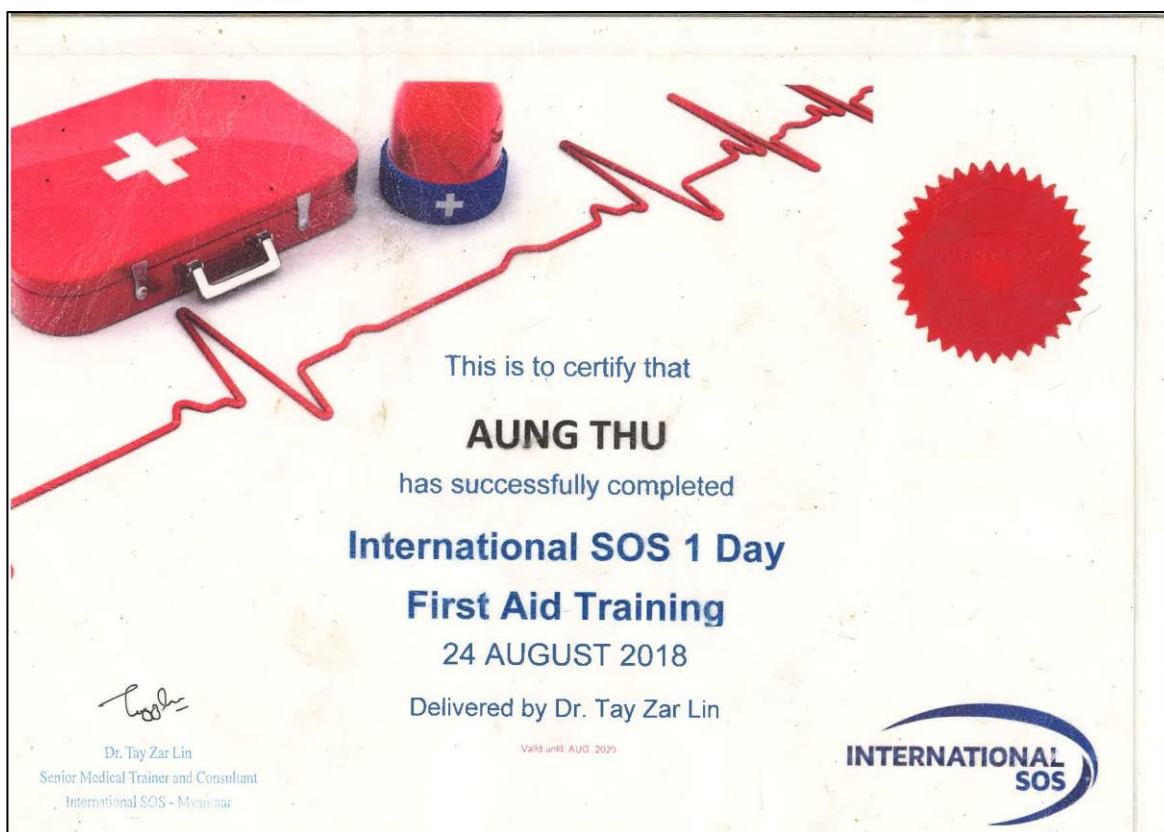
အထက်ပါကိစ္စနှင့်စပ်လျဉ်း၍ ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးခရိုင်၊ ပဲခူးမြို့နယ်၊ ဆောင်အင်းပြည်ပစက်မှုဇုန်၊ အမှတ်(၃-၁၃)၊ ရပ်ကွက်ကြီး(၉)၊ ဥသာမြို့သစ်၊ မြေဧရိယာ(၅၆.၀၀)ဧကတွင် Myanmar Carlsberg Co.,Ltd ဘီယာချက်စက်ရုံမြေအဖြစ် အသုံးပြုခွင့်ပြုရန် ရန်ကုန်တိုင်းဒေသကြီးအမှတ်(၅၁/ဘီ)၊ ရွှေတောင်ကြားလမ်း၊ ဗဟန်းရပ်ကွက်၊ ဗဟန်းမြို့နယ်နေ ဦးသန့်ဇင်ထွန်း နိုင်ငံသားစိစစ်ရေးကဒ်ပြား အမှတ်(၁၂/ဗဟန(နိုင်)၀၇၈၀၅) ကိုင်ဆောင် ထားသူမှ လျှောက်ထား လာမှုအပေါ် အဆိုပါမြေနေရာသည် ဝင်လမ်း/ ထွက်လမ်းကောင်းမွန်ပြီး ဘေးအန္တရာယ်ဆိုင်ရာ မီးဘေးနှင့်သဘာဝဘေးကြိုတင်ကာကွယ်နိုင်သည့် နေရာဖြစ်ပြီး အဆောက်အဦများ ဆောက်လုပ်ရာတွင်လည်း မီးသတ်ဦးစီးဌာန၏ အကြံပြုချက်များကို လိုက်နာဆောင်ရွက်မည်ဖြစ်ပါ၍ ကန့်ကွက်ရန် မရှိပါကြောင်း သဘောထား မှတ်ချက်ပြုပါသည်။

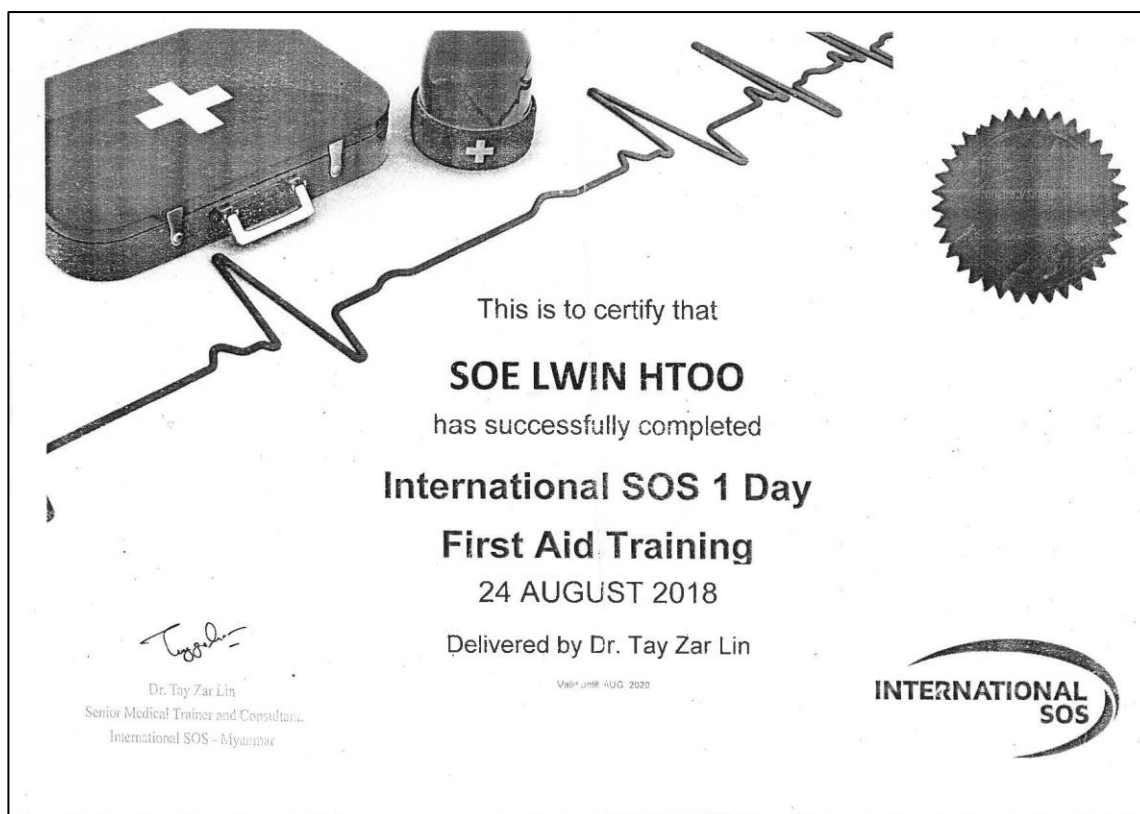
တိုင်းဒေသကြီးမီးသတ်ဦးစီးမှူး
(အောင်မြင်၊ ညွှန်ကြားရေးမှူး)
ပဲခူးတိုင်းဒေသကြီး

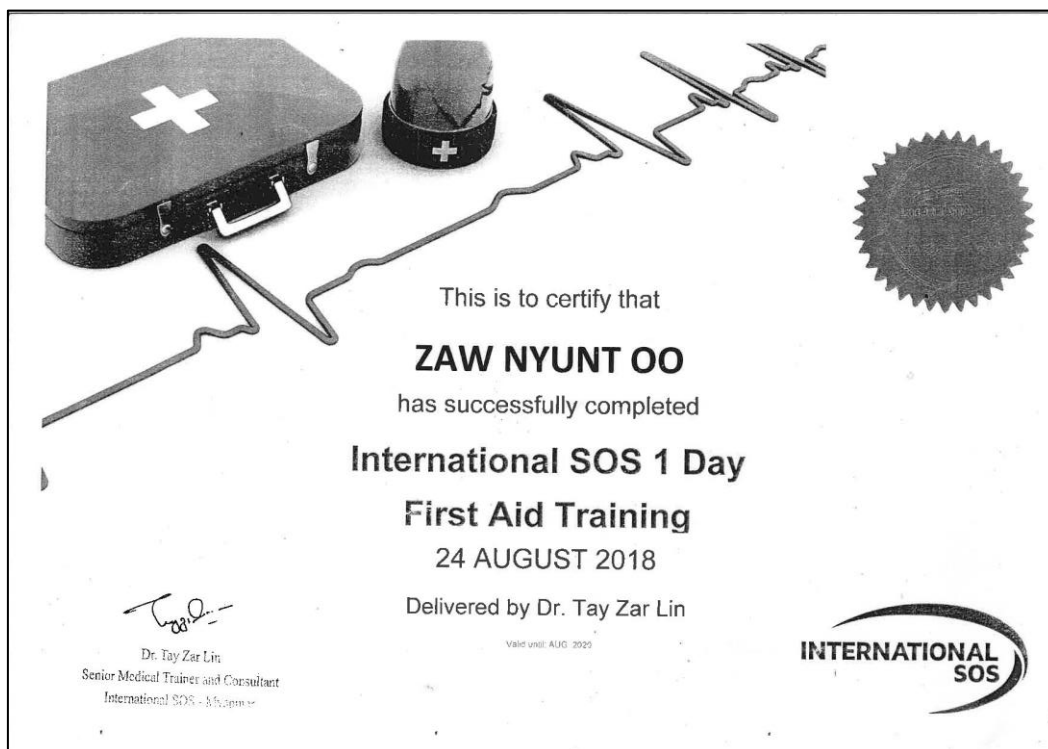
မိတ္တူ
လက်ခံစာတွဲ

APPENDIX E

Certificate by Myanmar Red Cross Society







APPENDIX F
Water Quality Results



ALARM Ecological Laboratory Water Testing Result Report



Report Number : EL-WR-20-00785		Date : 07-07-20			
Client Information Client Name : Organization : Myanmar Carlsberg Client ID : LC-10-003 Registration Date & Time : 25-06-20 Contact : Testing Purpose : For Standard		Sample Information Sample ID : WS-20-00750 Sample Name : Waste Water (P-1) Sample Type / Source : Waste Sampling Date & Time : 24-06-20 1:00 PM Sample Location : Bago Latitude : 17° 15' 24.77" N Longitude : 96° 27' 10.72" E			
Testing Results This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service. This report shall not be reproduced except in full, without written approval of the laboratory					
Sr.	Quality Parameters	Results	Units	Emission Standard	Remarks
1	pH	5.9	S.U	6.0 - 9.0 (d)	Nearly Acid Range
2	Temperature	25	°C	< +3 (d)*	-
3	Turbidity	186	FAU	-	-
4	Dissolved Oxygen	0.13	mg/L	-	-
5	Free Cyanide	<0.01	mg/L	≤0.1 (d)	Normal
6	Total Phosphorous	0.9	mg/L	≤ 2 (d)	Normal
7	Iron	4.7	mg/L	≤3.5 (d)	Above the limit
8	Lead	ND	mg/L	≤ 0.1 (d)	LOD=0.1

"ND"= Not Detected	"LOD"= Lower limit of detection	"-" = No Reference Standard
Tested by	Checked by	Approved by
 Daw Ma Mye Khine Lab. Technician II Ecological Laboratory ALARM	 Daw Lin Mye Myat Aung Lab. Technician I Ecological Laboratory ALARM	 Dr. Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)



ALARM Ecological Laboratory

Water Testing Result Report



Laboratory Testing Methods		
Parameters	Instruments / Methods	References / Descriptions
pH	pH Meter	Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS
Temperature, DO	DO Meter	Electrochemical probe method, Dissolved Oxygen Probe Measurement (Approved by EPA, ISO, ASTM)
All Others parameters	SpectroDirect Methods	Horiba DO electrode certified with IP67 standards and measures
TDS	TDS Meter	Lovibond brand reagent testing methods, precision of the methods are identical to the precision specified in the standard literature of AWWA and ISO
Conductivity	Conductivity Meter	Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS
BOD	BOD Testing Method	Method 405.1, USEPA Method for Chemical Analysis of Water and Waste water
Lead, Copper, Cadmium, Sodium	Atomic Adsorption Spectrophotometer	Shimadzu AA-6200, which is based on the Japan Water Standard Testing Method also approved by EPA and ASTM
Arsenic	Arsenic Test Kit	Lovibond brand Arsenic Test kit certified by DIN ISO 1997/ Follow Procedure: Meets WHO requirements:

Standards References		
Index	Standard Names	References
a	WHO Standard for Drinking Water (2011)	Guidelines for Drinking-water Quality 4th edition, World Health Organization, 2011.
b	US EPA Drinking Water Standard 2018	2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, USEPA, Washington, DC, March 2018
c	Available Myanmar Drinking Water Standard	Proposed National Drinking Water Standards, Ministry of Health, September 2014
d	Myanmar Emission Guideline (2015)	National Environmental Quality (Emission) Guidelines, Order No. (615/2015) MOECAP, 2015, December 29
*	At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge.	

Quality Parameters Descriptions

pH: Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Water generally becomes more corrosive with decreasing pH; however, excessively alkaline water also may be corrosive.

Temperature: will have an impact on the acceptability of a number of other inorganic constituents and chemical contaminants that may affect taste. High water temperature enhances the growth of microorganisms and may increase problems related to taste, odor, color and corrosion.

Color: Drinking-water should ideally have no visible color. Color in drinking-water is usually due to the presence of colored organic matter (primarily humic and fulvic acids) associated with the humus fraction of soil. Color is also strongly influenced by the presence of iron and other metals, either as natural impurities or as corrosion products. It may also result from the contamination of the water source with industrial effluents and may be the first indication of a hazardous situation.

Turbidity: Turbidity in water is caused by suspended particles or colloidal matter that obstructs light transmission through the water. It may be caused by inorganic or organic matter or a combination of the two. Microorganisms (bacteria, viruses and protozoa) are typically attached to particulates, and removal of turbidity by filtration will significantly reduce microbial contamination in treated water.

Total Dissolved Solids (TDS): The total of all dissolved mineral constituents, usually expressed in milligrams per liter. The concentration of dissolved solids may affect the taste of water. Water that contains more than 1,000 mg/L is unsuitable for many industrial uses. Some dissolved mineral matter is desirable, otherwise the water would have no taste. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

Total Suspended Solids (TSS): Both organic and inorganic particles of all sizes can contribute to the suspended solids concentration. These solids include anything drifting or floating in the water, from sediment, silt and sand to plankton and algae. TSS are particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid.

Total Solid: Total solids are dissolved solids plus suspended solids in water.

Conductivity: is nothing but the measure of the capability of water to pass the flow of electric current. This ability of conductance is said to be directly proportional to the concentration of the ions present in the water.

Chloride: Large concentrations increase the corrosiveness of water and, in combination with sodium, give water a salty taste.

Hardness: Related to the soap-consuming characteristics of water; results in formation of scum when soap is added. May cause deposition of scale in boilers, water heaters, and pipes. Hardness contributed by calcium and magnesium, bicarbonate and carbonate mineral species in water is called carbonate hardness; hardness in excess of this concentration is called noncarbonate hardness. Water that has a hardness less than 61 mg/L is considered soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; and more than 180 mg/L, very hard.

Dissolved Oxygen: is required by higher forms of aquatic life for survival. Depletion of dissolved oxygen in water supplies can

encourage thermophilic reduction of nitrate to nitrite and sulfate to sulfide. It can also cause an increase in the concentration of ferrous iron in solution.

Biological/Chemical Oxygen Demand (BOD&COD): BOD is similar in function to chemical oxygen demand (COD), in that both measure the amount of organic compounds in water. However, COD is less specific, since it measures everything that can be chemically oxidized, rather than just levels of biologically active organic matter.

Aluminum: No known necessary role in human or animal diet. Nontoxic in the concentrations normally found in natural water supplies. Elevated dissolved aluminum concentrations in some low pH waters can be toxic to some types of fish.

Manganese: Causes gray or black stains on porcelain, enamel, and fabrics. Can promote growth of certain kinds of bacteria that clog pipes and wells.

Sodium & Potassium: Large concentrations may limit use of water for irrigation and industrial use and, in combination with chloride, give water a salty taste. Abnormally large concentrations may indicate natural brines, industrial brines, or sewage.

Zinc: Essential and beneficial in metabolism; its deficiency in young children or animals will retard growth and may decrease general body resistance to disease. Seems to have no ill effects even in fairly large concentrations (20,000-40,000 mg/L), but can impart a metallic taste or milky appearance to water. Zinc in drinking water commonly is derived from galvanized coatings of piping.

Iron: Forms rust-colored sediment; stains laundry, utensils, and fixtures reddish brown. Objectionable for food and beverage processing. Can promote growth of certain kinds of bacteria that clog pipes and well openings.

Arsenic: is toxic. A cumulative poison that is slowly excreted. Can cause nasal ulcers; damage to the kidneys, liver, and intestinal walls; and death. Recently suspected to be a carcinogen.

Chlorine: is added to water supplies to kill bacteria. Short term exposure to chlorine comes primarily from bathing and other activities that use hot water rather than from drinking. Short term exposure irritates the eyes and lungs, and within 15 minutes of exposure victims experience coughing, shortness of breath and headaches. Regular exposure to chlorine in the home has been associated with asthma and other respiratory diseases.

Cyanide: is highly acutely toxic. It is detoxified in the liver by first-pass metabolism following oral exposure. As a consequence, exposure to a dose spread over a longer period, through a day, for example, will result in lower toxicity, or higher tolerance, than the same dose given in a single bolus dose.

Nitrite: Commonly formed as an intermediate product in bacterially mediated nitrification and denitrification of ammonia and other organic nitrogen compounds. An acute health concern at certain levels of exposure. Nitrite typically occurs in water from fertilizers and is found in sewage and wastes from humans and farm animals. Concentrations greater than 1.0 mg/L, as nitrogen, may be injurious when used in feeding infants.

Nitrate & Nitrate-N: Concentrations greater than local background levels may indicate pollution by feedlot runoff, sewage, or fertilizers. Concentrations greater than 10 mg/L, as nitrogen, may be injurious when used in feeding infants.

Phosphorus & ortho-phosphate: Dense algal blooms or rapid plant growth can occur in waters rich in phosphorus. A limiting nutrient for eutrophication since it is typically in shortest supply. Sources are human and animal wastes and fertilizers.

Ammonia: Plant nutrient that can cause unwanted algal blooms and excessive plant growth when present at elevated levels in water bodies. Sources include decomposition of animal and plant proteins, agricultural and urban runoff, and effluent from wastewater treatment plants.

Lead: A cumulative poison, toxic in small concentrations. Can cause lethargy, loss of appetite, constipation, anemia, abdominal pain, gradual paralysis in the muscles, and death.

Copper: Essential to metabolism; copper deficiency in infants and young animals results in nutritional anemia. Large concentrations of copper are toxic and may cause liver damage. Moderate levels of copper (near the action level) can cause gastro-intestinal distress.

Cadmium: A cumulative poison; very toxic. Not known to be either biologically essential or beneficial. Believed to promote renal arterial hypertension. Elevated concentrations may cause liver and kidney damage, or even anemia, retarded growth, and death.

Nickel: Very toxic to some plants and animals. Toxicity for humans is believed to be very minimal.

Sulfide: The "rotten eggs" odor of hydrogen sulfide is particularly noticeable in some ground waters and in stagnant drinking-water in the distribution system, as a result of oxygen depletion and the subsequent reduction of sulfate by bacterial activity. Sulfide is oxidized rapidly to sulfate in well-aerated or chlorinated water, and hydrogen sulfide levels in oxygenated water supplies are normally very low.

Sulfate: Sulfates of calcium and magnesium form hard scale. Large concentrations of sulfate have a laxative effect on some people and, in combination with other ions, give water a bitter taste.

Alkalinity: A measure of the capacity of unfiltered water to neutralize acid. In almost all natural waters alkalinity is produced by the dissolved carbon dioxide species, bicarbonate and carbonate.

Phenol: The presence of phenol in drinking water probably results from using contaminated surface water or groundwater as a source. Its presence in groundwater is probably the result of release to soil, often industrial releases or leachate from waste dumps, and the subsequent leaching of phenol through the soil to the groundwater. Chlorophenols are present in drinking water as a result of the chlorination of phenols as by-products of the reaction of hypochlorite with phenolic acids, as biocides or as degradation products of phenoxy herbicides. IARC has classified 2,4,6-trichlorophenol in Group 2B (possibly carcinogenic to humans).


Boron: Essential to plant growth, but may be toxic to crops when present in excessive concentrations in irrigation water. Sensitive plants show damage when irrigation water contains more than 670 µg/L and even tolerant plants may be damaged when boron exceeds 2,000 µg/L. The recommended limit is 750 µg/L for long-term irrigation on sensitive crops.

Fluoride: To produce signs of acute fluoride intoxication, minimum oral doses of about 1 mg of fluoride per kilogram of body weight were required. Concentrations above this guideline value (1.5mg/L) carry an increasing risk of dental fluorosis and that progressively higher concentrations lead to increasing risks of skeletal fluorosis.

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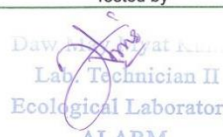
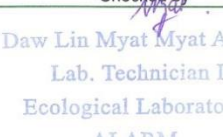
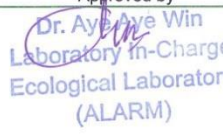


## ALARM Ecological Laboratory

### Water Testing Result Report



| <b>Report Number : EL-WR-20-00786</b>                                                                                                                                                                                                                                       |                    | <b>Date : 07-07-20</b>                                                                                                                                                                                                                                        |       |                   |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------|---------|
| <b>Client Information</b><br>Client Name :<br>Organization : Myanmar Carlsberg<br>Client ID : LC-10-003<br>Registration Date & Time : 25-06-20<br>Contact :<br>Testing Purpose : For Standard                                                                               |                    | <b>Sample Information</b><br>Sample ID : WS-20-00751<br>Sample Name : Waste Water (P-2)<br>Sample Type / Source : Treated<br>Sampling Date & Time : 24-06-20 1:05 PM<br>Sample Location : Bago<br>Latitude : 17° 15' 22.86" N<br>Longitude : 96° 27' 10.75" E |       |                   |         |
| <b>Testing Results</b><br><i>This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.<br/>         This report shall not be reproduced except in full, without written approval of the laboratory</i> |                    |                                                                                                                                                                                                                                                               |       |                   |         |
| Sr.                                                                                                                                                                                                                                                                         | Quality Parameters | Results                                                                                                                                                                                                                                                       | Units | Emission Standard | Remarks |
| 1                                                                                                                                                                                                                                                                           | pH                 | 7.1                                                                                                                                                                                                                                                           | S.U   | 6.0 - 9.0 (d)     | Normal  |
| 2                                                                                                                                                                                                                                                                           | Temperature        | 25                                                                                                                                                                                                                                                            | °C    | < +3 (d)*         | -       |
| 3                                                                                                                                                                                                                                                                           | Turbidity          | <5                                                                                                                                                                                                                                                            | FAU   | -                 | -       |
| 4                                                                                                                                                                                                                                                                           | Dissolved Oxygen   | 4.8                                                                                                                                                                                                                                                           | mg/L  | -                 | -       |
| 5                                                                                                                                                                                                                                                                           | Free Cyanide       | <0.01                                                                                                                                                                                                                                                         | mg/L  | ≤0.1 (d)          | Normal  |
| 6                                                                                                                                                                                                                                                                           | Total Phosphorous  | 1.2                                                                                                                                                                                                                                                           | mg/L  | ≤ 2 (d)           | Normal  |
| 7                                                                                                                                                                                                                                                                           | Iron               | <0.1                                                                                                                                                                                                                                                          | mg/L  | ≤3.5 (d)          | Normal  |
| 8                                                                                                                                                                                                                                                                           | Lead               | ND                                                                                                                                                                                                                                                            | mg/L  | ≤ 0.1 (d)         | LOD=0.1 |

|                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| "ND"= Not Detected<br>Tested by<br><div style="text-align: center;"> <br/>           Daw Lin Myat Myat Aung<br/>           Lab. Technician II<br/>           Ecological Laboratory<br/> <b>ALARM</b> </div> | "LOD"= Lower limit of detection<br>Checked by<br><div style="text-align: center;"> <br/>           Daw Lin Myat Myat Aung<br/>           Lab. Technician I<br/>           Ecological Laboratory<br/> <b>ALARM</b> </div> | "-" = No Reference Standard<br>Approved by<br><div style="text-align: center;"> <br/>           Dr. Aye Aye Win<br/>           Laboratory in-Charge<br/>           Ecological Laboratory<br/>           (ALARM)         </div> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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## ALARM Ecological Laboratory

### Water Testing Result Report



| Laboratory Testing Methods    |                                     |                                                                                                                                                                 |
|-------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters                    | Instruments / Methods               | References / Descriptions                                                                                                                                       |
| pH                            | pH Meter                            | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                                    |
| Temperature, DO               | DO Meter                            | Electrochemical probe method, Dissolved Oxygen Probe Measurement (Approved by EPA, ISO, ASTM)<br>Horiba DO electrode certified with IP67 standards and measures |
| All Others parameters         | SpectroDirect Methods               | Lovibond brand reagent testing methods, precision of the methods are identical to the precision specified in the standard literature of AWWA and ISO            |
| TDS                           | TDS Meter                           | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                                    |
| Conductivity                  | Conductivity Meter                  | Electrode method, conductivity cell (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                 |
| BOD                           | BOD Testing Method                  | Method 405.1, USEPA Method for Chemical Analysis of Water and Waste water                                                                                       |
| Lead, Copper, Cadmium, Sodium | Atomic Adsorption Spectrophotometer | Shimadzu AA-6200, which is based on the Japan Water Standard Testing Method also approved by EPA and ASTM                                                       |
| Arsenic                       | Arsenic Test Kit                    | Lovibond brand Arsenic Test kit: certified by DIN ISO 1997 / Follow Procedure: Meets WHO requirements:                                                          |

| Standards References |                                                                                                                                                                                                                                                       |                                                                                                                                          |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Index                | Standard Names                                                                                                                                                                                                                                        | References                                                                                                                               |
| a                    | WHO Standard for Drinking Water (2011)                                                                                                                                                                                                                | Guidelines for Drinking-water Quality 4th edition, World Health Organization, 2011.                                                      |
| b                    | US EPA Drinking Water Standard 2018                                                                                                                                                                                                                   | 2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, USEPA, Washington, DC, March 2018 |
| c                    | Available Myanmar Drinking Water Standard                                                                                                                                                                                                             | Proposed National Drinking Water Standards, Ministry of Health, September 2014                                                           |
| d                    | Myanmar Emission Guideline (2015)                                                                                                                                                                                                                     | National Environmental Quality (Emission) Guidelines, Order No. (615/2015) MOECAP, 2015, December 29.                                    |
| *                    | At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge. |                                                                                                                                          |

### Quality Parameters Descriptions

**pH:** Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Water generally becomes more corrosive with decreasing pH; however, excessively alkaline water also may be corrosive.

**Temperature:** will have an impact on the acceptability of a number of other inorganic constituents and chemical contaminants that may affect taste. High water temperature enhances the growth of microorganisms and may increase problems related to taste, odor, color and corrosion.

**Color:** Drinking-water should ideally have no visible color. Color in drinking-water is usually due to the presence of colored organic matter (primarily humic and fulvic acids) associated with the humus fraction of soil. Color is also strongly influenced by the presence of iron and other metals, either as natural impurities or as corrosion products. It may also result from the contamination of the water source with industrial effluents and may be the first indication of a hazardous situation.

**Turbidity:** Turbidity in water is caused by suspended particles or colloidal matter that obstructs light transmission through the water. It may be caused by inorganic or organic matter or a combination of the two. Microorganisms (bacteria, viruses and protozoa) are typically attached to particulates, and removal of turbidity by filtration will significantly reduce microbial contamination in treated water.

**Total Dissolved Solid (TDS):** The total of all dissolved mineral constituents, usually expressed in milligrams per liter. The concentration of dissolved solids may affect the taste of water. Water that contains more than 1,000 mg/L is unsuitable for many industrial uses. Some dissolved mineral matter is desirable, otherwise the water would have no taste. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

**Total Suspended Solid (TSS):** Both organic and inorganic particles of all sizes can contribute to the suspended solids concentration. These solids include anything drifting or floating in the water, from sediment, silt and sand to plankton and algae. TSS are particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid.

**Total Solid:** Total solids are dissolved solids plus suspended solids in water.

**Conductivity:** is nothing but the measure of the capability of water to pass the flow of electric current. This ability of conductance is said to be directly proportional to the concentration of the ions present in the water.

**Chloride:** Large concentrations increase the corrosiveness of water and, in combination with sodium, give water a salty taste.

**Hardness:** Related to the soap-consuming characteristics of water; results in formation of scum when soap is added. May cause deposition of scale in boilers, water heaters, and pipes. Hardness contributed by calcium and magnesium, bicarbonate and carbonate mineral species in water is called carbonate hardness; hardness in excess of this concentration is called noncarbonate hardness. Water that has a hardness less than 61 mg/L is considered soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; and more than 180 mg/L, very hard.

**Dissolved Oxygen:** is required by higher forms of aquatic life for survival. Depletion of dissolved oxygen in water supplies can

encourage thermophilic reduction of nitrate to nitrite and sulfate to sulfide. It can also cause an increase in the concentration of ferrous iron in solution.

**Biological/Chemical Oxygen Demand (BOD&COD):** BOD is similar in function to chemical oxygen demand (COD), in that both measure the amount of organic compounds in water. However, COD is less specific, since it measures everything that can be chemically oxidized, rather than just levels of biologically active organic matter.

**Aluminum:** No known necessary role in human or animal diet. Nontoxic in the concentrations normally found in natural water supplies. Elevated dissolved aluminum concentrations in some low pH waters can be toxic to some types of fish.

**Manganese:** Causes gray or black stains on porcelain, enamel, and fabrics. Can promote growth of certain kinds of bacteria that clog pipes and wells.

**Sodium & Potassium:** Large concentrations may limit use of water for irrigation and industrial use and, in combination with chloride, give water a salty taste. Abnormally large concentrations may indicate natural brines, industrial brines, or sewage.

**Zinc:** Essential and beneficial in metabolism; its deficiency in young children or animals will retard growth and may decrease general body resistance to disease. Seems to have no ill effects even in fairly large concentrations (20,000-40,000 mg/L), but can impart a metallic taste or milky appearance to water. Zinc in drinking water commonly is derived from galvanized coatings of piping.

**Iron:** Forms rust-colored sediment; stains laundry, utensils, and fixtures reddish brown. Objectionable for food and beverage processing. Can promote growth of certain kinds of bacteria that clog pipes and well openings.

**Arsenic:** is toxic. A cumulative poison that is slowly excreted. Can cause nasal ulcers; damage to the kidneys, liver, and intestinal walls; and death. Recently suspected to be a carcinogen.

**Chlorine:** is added to water supplies to kill bacteria. Short term exposure to chlorine comes primarily from bathing and other activities that use hot water rather than from drinking. Short term exposure irritates the eyes and lungs, and within 15 minutes of exposure victims experience coughing, shortness of breath and headaches. Regular exposure to chlorine in the home has been associated with asthma and other respiratory diseases.

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**Nitrite:** Commonly formed as an intermediate product in bacterially mediated nitrification and denitrification of ammonia and other organic nitrogen compounds. An acute health concern at certain levels of exposure. Nitrite typically occurs in water from fertilizers and is found in sewage and wastes from humans and farm animals. Concentrations greater than 1.0 mg/L, as nitrogen, may be injurious when used in feeding infants.

**Nitrate & Nitrate-N:** Concentrations greater than local background levels may indicate pollution by feedlot runoff, sewage, or fertilizers. Concentrations greater than 10 mg/L, as nitrogen, may be injurious when used in feeding infants.

**Phosphorus & ortho-phosphate:** Dense algal blooms or rapid plant growth can occur in waters rich in phosphorus. A limiting nutrient for eutrophication since it is typically in shortest supply. Sources are human and animal wastes and fertilizers.

**Ammonia:** Plant nutrient that can cause unwanted algal blooms and excessive plant growth when present at elevated levels in water bodies. Sources include decomposition of animal and plant proteins, agricultural and urban runoff, and effluent from wastewater treatment plants.

**Lead:** A cumulative poison, toxic in small concentrations. Can cause lethargy, loss of appetite, constipation, anemia, abdominal pain, gradual paralysis in the muscles, and death.

**Copper:** Essential to metabolism; copper deficiency in infants and young animals results in nutritional anemia. Large concentrations of copper are toxic and may cause liver damage. Moderate levels of copper (near the action level) can cause gastro-intestinal distress.

**Cadmium:** A cumulative poison; very toxic. Not known to be either biologically essential or beneficial. Believed to promote renal arterial hypertension. Elevated concentrations may cause liver and kidney damage, or even anemia, retarded growth, and death.

**Nickel:** Very toxic to some plants and animals. Toxicity for humans is believed to be very minimal.

**Sulfide:** The "rotten eggs" odor of hydrogen sulfide is particularly noticeable in some ground waters and in stagnant drinking-water in the distribution system, as a result of oxygen depletion and the subsequent reduction of sulfate by bacterial activity. Sulfide is oxidized rapidly to sulfate in well-aerated or chlorinated water, and hydrogen sulfide levels in oxygenated water supplies are normally very low.

**Sulfate:** Sulfates of calcium and magnesium form hard scale. Large concentrations of sulfate have a laxative effect on some people and, in combination with other ions, give water a bitter taste.

**Alkalinity:** A measure of the capacity of unfiltered water to neutralize acid. In almost all natural waters alkalinity is produced by the dissolved carbon dioxide species, bicarbonate and carbonate.

**Phenol:** The presence of phenol in drinking water probably results from using contaminated surface water or groundwater as a source. Its presence in groundwater is probably the result of release to soil, often industrial releases or leachate from waste dumps, and the subsequent leaching of phenol through the soil to the groundwater. Chlorophenols are present in drinking-water as a result of the chlorination of phenols, as by-products of the reaction of hypochlorite with phenolic acids, as biocides or as degradation products of phenoxy herbicides. IARC has classified 2,4,6-trichlorophenol in Group 2B (possibly carcinogenic to humans).

**Boron:** Essential to plant growth, but may be toxic to crops when present in excessive concentrations in irrigation water. Sensitive plants show damage when irrigation water contains more than 670 µg/L and even tolerant plants may be damaged when boron exceeds 2,000 µg/L. The recommended limit is 750 µg/L for long-term irrigation on sensitive crops.

**Fluoride:** To produce signs of acute fluoride intoxication, minimum oral doses of about 1 mg of fluoride per kilogram of body weight were required. Concentrations above this guideline value (1.5mg/L) carry an increasing risk of dental fluorosis and that progressively higher concentrations lead to increasing risks of skeletal fluorosis.

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ALARM Ecological Laboratory Water Testing Result Report



| Report Number : EL-WR-20-00783 | | Date : 07-07-20 | | | |
|--|--------------------|---|-------|---|-------------------|
| Client Information
Client Name :
Organization : Myanmar Carlsberg
Client ID : LC-10-003
Registration Date & Time : 25-06-20
Contact : +95 9401604493
Testing Purpose : For Standard | | Sample Information
Sample ID : WS-20-00748
Sample Name : Tube Well (P-3)
Sample Type / Source : Ground
Sampling Date & Time : 24-06-20 2:00 PM
Sample Location : Bago
Latitude : 17° 15' 30.98" N
Longitude : 96° 27' 18.58" E | | | |
| Testing Results
<i>This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.
This report shall not be reproduced except in full, without written approval of the laboratory</i> | | | | | |
| Sr. | Quality Parameters | Results | Units | Drinking Standards | Remarks |
| 1 | pH | 6.4 | S.U | 6.5 - 8.5 (b) | Nearly Acid Range |
| 2 | Temperature | 25 | °C | - | - |
| 3 | Turbidity | <5 | FAU | ≤5 (b) | Clear |
| 4 | TDS | 116 | mg/L | ≤500 (b) | Normal |
| 5 | TSS | 0 | mg/L | - | - |
| 6 | Dissolved Oxygen | 7.4 | mg/L | - | - |
| 7 | BOD5 | 12 | mg/L | - | - |
| 8 | COD | <30 | mg/L | - | - |
| 9 | Free Cyanide | <0.01 | mg/L | - | - |
| 10 | Total Phosphorous | 0.25 | mg/L | - | - |
| 11 | Iron | <0.1 | mg/L | ≤0.3 (b) | Normal |
| 12 | Lead | ND | mg/L | ≤0.01 (a) | LOD=0.1 |
| 13 | Total Nitrogen | <0.5 | mg/L | - | - |
| <p>"ND"= Not Detected "LOD"= Lower limit of detection "-" = No Reference Standard</p> | | | | | |
| Tested by | | Checked by | | Approved by | |
|
Daw May Myat Khine
Lab. Technician II
Ecological Laboratory
ALARM | |
Daw Lin Myat Myat Aung
Lab. Technician I
Ecological Laboratory
ALARM | |
Dr. Aye Aye Win
Laboratory In-Charge
Ecological Laboratory
(ALARM) | |



ALARM Ecological Laboratory

Water Testing Result Report



| Laboratory Testing Methods | | |
|-------------------------------|-------------------------------------|--|
| Parameters | Instruments / Methods | References / Descriptions |
| pH | pH Meter | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS |
| Temperature, DO | DO Meter | Electrochemical probe method, Dissolved Oxygen Probe Measurement (Approved by EPA, ISO, ASTM)
Hanna DO electrode certified with IP67 standards and measures |
| All Others parameters | SpectroDirect Methods | Lovibond brand reagent testing methods, precision of the methods are identical to the precision specified in the standard literature of AWWA and ISO |
| TDS | TDS Meter | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS |
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| Arsenic | Arsenic Test Kit | Lovibond brand Arsenic Test kit certified by DIN ISO 19977 Follow Procedure: Meets WHO requirements: |

| Standards References | | |
|----------------------|---|--|
| Index | Standard Names | References |
| a | WHO Standard for Drinking Water (2011) | Guidelines for Drinking-water Quality 4th edition, World Health Organization, 2011. |
| b | US EPA Drinking Water Standard 2018 | 2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, USEPA, Washington, DC, March 2018 |
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| e | At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge. | |

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Chlorine: is added to water supplies to kill bacteria. Short term exposure to chlorine comes primarily from bathing and other activities that use hot water rather than from drinking. Short term exposure irritates the eyes and lungs, and within 15 minutes of exposure victims experience coughing, shortness of breath and headaches. Regular exposure to chlorine in the home has been associated with asthma and other respiratory diseases.

Cyanide: is highly acutely toxic. It is detoxified in the liver by first-pass metabolism following oral exposure. As a consequence, exposure to a dose spread over a longer period, through a day, for example, will result in lower toxicity, or higher tolerance, than the same dose given in a single bolus dose.

Nitrite: Commonly formed as an intermediate product in bacterially mediated nitrification and denitrification of ammonia and other organic nitrogen compounds. An acute health concern at certain levels of exposure. Nitrite typically occurs in water from fertilizers and is found in sewage and wastes from humans and farm animals. Concentrations greater than 1.0 mg/L, as nitrogen, may be injurious when used in feeding infants.

Nitrate: Nitrate-N. Concentrations greater than local background levels may indicate pollution by feedlot runoff, sewage, or fertilizers. Concentrations greater than 10 mg/L, as nitrogen, may be injurious when used in feeding infants.

Phosphorus & ortho-phosphate: Dense algal blooms or rapid plant growth can occur in waters rich in phosphorus. A limiting nutrient for eutrophication since it is typically in shortest supply. Sources are human and animal wastes and fertilizers.

Ammonia: Plant nutrient that can cause unwanted algal blooms and excessive plant growth when present at elevated levels in water bodies. Sources include decomposition of animal and plant proteins, agricultural and urban runoff, and effluent from wastewater treatment plants.

Lead: A cumulative poison, toxic in small concentrations. Can cause lethargy, loss of appetite, constipation, anemia, abdominal pain, gradual paralysis in the muscles, and death.

Copper: Essential to metabolism; copper deficiency in infants and young animals results in nutritional anemia. Large concentrations of copper are toxic and may cause liver damage. Moderate levels of copper (near the action level) can cause gastro-intestinal distress.

Cadmium: A cumulative poison; very toxic. Not known to be either biologically essential or beneficial. Believed to promote renal arterial hypertension. Elevated concentrations may cause liver and kidney damage, or even anemia, retarded growth, and death.

Nickel: Very toxic to some plants and animals. Toxicity for humans is believed to be very minimal.

Sulfide: The "rotten eggs" odor of hydrogen sulfide is particularly noticeable in some ground waters and in stagnant drinking-water in the distribution system, as a result of oxygen depletion and the subsequent reduction of sulfate by bacterial activity. Sulfide is oxidized rapidly to sulfate in well-aerated or chlorinated water, and hydrogen sulfide levels in oxygenated water supplies are normally very low.

Sulfate: Sulfates of calcium and magnesium form hard scale. Large concentrations of sulfate have a laxative effect on some people and, in combination with other ions, give water a bitter taste.

Alkalinity: A measure of the capacity of unfiltered water to neutralize acid. In almost all natural waters alkalinity is produced by the dissolved carbon dioxide species, bicarbonate and carbonate.

Phenol: The presence of phenol in drinking water probably results from using contaminated surface water or groundwater as a source. Its presence in groundwater is probably the result of release to soil, often industrial releases or leachate from waste dumps, and the subsequent leaching of phenol through the soil to the groundwater. Chlorophenols are present in drinking-water as a result of the chlorination of phenols, as by-products of the reaction of hypochlorite with phenolic acids, as biocides or as degradation products of phenoxyl herbicides. IARC has classified 2,4,6-trichlorophenol in Group 2B (possibly carcinogenic to humans).

Boron: Essential to plant growth, but may be toxic to crops when present in excessive concentrations in irrigation water. Sensitive plants show damage when irrigation water contains more than 670 µg/L and even tolerant plants may be damaged when boron exceeds 2,000 µg/L. The recommended limit is 750 µg/L for long-term irrigation on sensitive crops.

Fluoride: To produce signs of acute fluoride intoxication, minimum oral doses of about 1 mg of fluoride per kilogram of body weight were required. Concentrations above this guideline value (1.5 mg/L) carry an increasing risk of dental fluorosis and that progressively higher concentrations lead to increasing risks of skeletal fluorosis.

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## ALARM Ecological Laboratory Water Testing Result Report



| <b>Report Number : EL-WR-20-00784</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                   | <b>Date : 07-07-20</b>                                                                                                                                                                                                                                      |       |                    |         |           |            |             |                                                                           |                                                                                   |                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------|---------|-----------|------------|-------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>Client Information</b><br>Client Name :<br>Organization : Myanmar Carlsberg<br>Client ID : LC-10-003<br>Registration Date & Time : 25-06-20<br>Contact : +95 9401604493<br>Testing Purpose : For standard                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   | <b>Sample Information</b><br>Sample ID : WS-20-00749<br>Sample Name : Tube Well (P-4)<br>Sample Type / Source : Treated<br>Sampling Date & Time : 24-06-20 2:20 PM<br>Sample Location : Bago<br>Latitude : 17° 15' 26.22' N<br>Longitude : 96° 27' 16.15' E |       |                    |         |           |            |             |                                                                           |                                                                                   |                                                                                 |
| <b>Testing Results</b><br><i>This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.<br/>         This report shall not be reproduced except in full, without written approval of the laboratory</i>                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                   |                                                                                                                                                                                                                                                             |       |                    |         |           |            |             |                                                                           |                                                                                   |                                                                                 |
| Sr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Quality Parameters                                                                | Results                                                                                                                                                                                                                                                     | Units | Drinking Standards | Remarks |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | pH                                                                                | 6.3                                                                                                                                                                                                                                                         | S.U   | 6.5 - 8.5 (b)      | Normal  |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Temperature                                                                       | 25                                                                                                                                                                                                                                                          | °C    | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Turbidity                                                                         | <5                                                                                                                                                                                                                                                          | FAU   | ≤5 (b)             | Clear   |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TDS                                                                               | 107                                                                                                                                                                                                                                                         | mg/L  | ≤500 (b)           | Normal  |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TSS                                                                               | 0                                                                                                                                                                                                                                                           | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Dissolved Oxygen                                                                  | 6.98                                                                                                                                                                                                                                                        | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | BOD5                                                                              | 10                                                                                                                                                                                                                                                          | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | COD                                                                               | <30                                                                                                                                                                                                                                                         | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Free Cyanide                                                                      | <0.01                                                                                                                                                                                                                                                       | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Total Phosphorous                                                                 | 0.16                                                                                                                                                                                                                                                        | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Iron                                                                              | <0.1                                                                                                                                                                                                                                                        | mg/L  | ≤0.3 (b)           | Normal  |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Lead                                                                              | ND                                                                                                                                                                                                                                                          | mg/L  | ≤0.01 (a)          | LOD=0.1 |           |            |             |                                                                           |                                                                                   |                                                                                 |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Total Nitrogen                                                                    | <0.5                                                                                                                                                                                                                                                        | mg/L  | -                  | -       |           |            |             |                                                                           |                                                                                   |                                                                                 |
| <p>"ND"= Not Detected      "LOD"= Lower limit of detection      "-" = No Reference Standard</p> <table border="1"> <tr> <td>Tested by</td> <td>Checked by</td> <td>Approved by</td> </tr> <tr> <td> <br/>           Daw May Khine<br/>           Lab. Technician II<br/>           Ecological Laboratory<br/>           ALARM         </td> <td> <br/>           Daw Lin Myat Myat Aung<br/>           Lab. Technician I<br/>           Ecological Laboratory<br/>           ALARM         </td> <td> <br/>           Dr. Aye Aye Win<br/>           Laboratory In-Charge<br/>           Ecological Laboratory<br/>           (ALARM)         </td> </tr> </table> |                                                                                   |                                                                                                                                                                                                                                                             |       |                    |         | Tested by | Checked by | Approved by | <br>Daw May Khine<br>Lab. Technician II<br>Ecological Laboratory<br>ALARM | <br>Daw Lin Myat Myat Aung<br>Lab. Technician I<br>Ecological Laboratory<br>ALARM | <br>Dr. Aye Aye Win<br>Laboratory In-Charge<br>Ecological Laboratory<br>(ALARM) |
| Tested by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Checked by                                                                        | Approved by                                                                                                                                                                                                                                                 |       |                    |         |           |            |             |                                                                           |                                                                                   |                                                                                 |
| <br>Daw May Khine<br>Lab. Technician II<br>Ecological Laboratory<br>ALARM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <br>Daw Lin Myat Myat Aung<br>Lab. Technician I<br>Ecological Laboratory<br>ALARM | <br>Dr. Aye Aye Win<br>Laboratory In-Charge<br>Ecological Laboratory<br>(ALARM)                                                                                                                                                                             |       |                    |         |           |            |             |                                                                           |                                                                                   |                                                                                 |





## ALARM Ecological Laboratory

### Water Testing Result Report



| Laboratory Testing Methods    |                                     |                                                                                                                                                                |
|-------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters                    | Instruments / Methods               | References / Descriptions                                                                                                                                      |
| pH                            | pH Meter                            | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                                   |
| Temperature, DO               | DO Meter                            | Electrochemical probe method, Dissolved Oxygen Probe Measurement (Approved by EPA, ISO, ASTM)<br>Horiba DO electrode certified with ISO standards and measures |
| All Others parameters         | SpectroDirect Methods               | Lovibond brand reagent testing methods, precision of the methods are identical to the precision specified in the standard literature of AWWA and ISO           |
| TDS                           | TDS Meter                           | Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                                   |
| Conductivity                  | Conductivity Meter                  | Electrode method, conductivity cell (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS                                |
| BOD                           | BOD Testing Method                  | Method 405.1, USEPA Method for Chemical Analysis of Water and Waste water                                                                                      |
| Lead, Copper, Cadmium, Sodium | Atomic Adsorption Spectrophotometer | Shimadzu AA-6200, which is based on the Japan Water Standard Testing Method also approved by EPA and ASTM                                                      |
| Arsenic                       | Arsenic Test Kit                    | Lovibond brand Arsenic Test kit certified by DIN ISO 19977 Follow Procedure: Meets WHO requirements:                                                           |

| Standards References |                                                                                                                                                                                                                                                       |                                                                                                                                          |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Index                | Standard Names                                                                                                                                                                                                                                        | References                                                                                                                               |
| a                    | WHO Standard for Drinking Water (2011)                                                                                                                                                                                                                | Guidelines for Drinking-water Quality 4th edition, World Health Organization, 2011.                                                      |
| b                    | US EPA Drinking Water Standard 2018                                                                                                                                                                                                                   | 2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, USEPA, Washington, DC, March 2018 |
| c                    | Available Myanmar Drinking Water Standard                                                                                                                                                                                                             | Proposed National Drinking Water Standards, Ministry of Health, September 2014                                                           |
| d                    | Myanmar Emission Guideline (2015)                                                                                                                                                                                                                     | National Environmental Quality (Emission) Guidelines, Order No. (615/2015) MOECAP, 2015, December 29.                                    |
| *                    | At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge. |                                                                                                                                          |

### Quality Parameters Descriptions

**pH:** Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Water generally becomes more corrosive with decreasing pH; however, excessively alkaline water also may be corrosive.

**Temperature:** will have an impact on the acceptability of a number of other inorganic constituents and chemical contaminants that may affect taste. High water temperature enhances the growth of microorganisms and may increase problems related to taste, odor, color and corrosion. **Color:** Drinking-water should ideally have no visible color. Color in drinking-water is usually due to the presence of colored organic matter (primarily humic and fulvic acids) associated with the humus fraction of soil. Color is also strongly influenced by the presence of iron and other metals, either as natural impurities or as corrosion products. It may also result from the contamination of the water source with industrial effluents and may be the first indication of a hazardous situation.

**Turbidity:** Turbidity in water is caused by suspended particles or colloidal matter that obstructs light transmission through the water. It may be caused by inorganic or organic matter or a combination of the two. Microorganisms (bacteria, viruses and protozoa) are typically attached to particulates, and removal of turbidity by filtration will significantly reduce microbial contamination in treated water.

**Total Dissolved Solid (TDS):** The total of all dissolved mineral constituents, usually expressed in milligrams per liter. The concentration of dissolved solids may affect the taste of water. Water that contains more than 1,000 mg/L is unsuitable for many industrial uses. Some dissolved mineral matter is desirable, otherwise the water would have no taste. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

**Total Suspended Solid (TSS):** Both organic and inorganic particles of all sizes can contribute to the suspended solids concentration. These solids include anything drifting or floating in the water, from sediment, silt and sand to plankton and algae. TSS are particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid.

**Total Solid:** Total solids are dissolved solids plus suspended solids in water.

**Conductivity:** is nothing but the measure of the capability of water to pass the flow of electric current. This ability of conductance is said to be directly proportional to the concentration of the ions present in the water.

**Chloride:** Large concentrations increase the corrosiveness of water and, in combination with sodium, give water a salty taste.

**Hardness:** Related to the soap-consuming characteristics of water; results in formation of scum when soap is added. May cause deposition of scale in boilers, water heaters, and pipes. Hardness contributed by calcium and magnesium, bicarbonate and carbonate mineral species in water is called carbonate hardness; hardness in excess of this concentration is called noncarbonate hardness. Water that has a hardness less than 61 mg/L is considered soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; and more than 180 mg/L, very hard.

**Dissolved Oxygen:** is required by higher forms of aquatic life for survival. Depletion of dissolved oxygen in water supplies can

encourage the microbial reduction of nitrate to nitrite and sulfate to sulfide. It can also cause an increase in the concentration of ferrous iron in solution.

**Biological/Chemical Oxygen Demand (BOD&COD):** BOD is similar in function to chemical oxygen demand (COD), in that both measure the amount of organic compounds in water. However, COD is less specific, since it measures everything that can be chemically oxidized, rather than just levels of biologically active organic matter.

**Aluminum:** No known necessary role in human or animal diet. Nontoxic in the concentrations normally found in natural water supplies. Elevated dissolved aluminum concentrations in some low pH waters can be toxic to some types of fish.

**Manganese:** Causes gray or black stains on porcelain, enamel, and fabrics. Can promote growth of certain kinds of bacteria that clog pipes and wells.

**Sodium & Potassium:** Large concentrations may limit use of water for irrigation and industrial use and, in combination with chloride, give water a salty taste. Abnormally large concentrations may indicate natural brines, industrial brines, or sewage.

**Zinc:** Essential and beneficial in metabolism; its deficiency in young children or animals will retard growth and may decrease general body resistance to disease. Seems to have no ill effects even in fairly large concentrations (20,000-40,000 mg/L), but can impart a metallic taste or milky appearance to water. Zinc in drinking water commonly is derived from galvanized coatings of piping.

**Iron:** Forms rust-colored sediment; stains laundry, utensils, and fixtures; reddish brown. Objectionable for food and beverage processing. Can promote growth of certain kinds of bacteria that clog pipes and well openings.

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| <div></div> <div>Carlsberg Myanmar Co.Ltd.</div> | | | | | | | | | | | | | | | | | | | | Format No | | QA - P3 - F1 - 68 | | | | | |
| <div></div> <div>Effluent Treatment Plant</div> | | | | | | | | | | | | | | | | | | | | Issue No / Date | | 1 / 01.06.2014 | | | | | |
| Daily Analysis Report (Month - June 2022) | | | | | | | | | | | | | | | | | | | | Revision No / Date | | 0 / 01.06.2014 | | | | | |
| Date | Waste water (Equalization) | | | | | | Buffer Tank | | LESBAR Overflow | | | | | | | | Aeration | | | | | Treated water | | | | | |
| | pH | Temp | COD | BOD | TSS | TDS | pH | Temp | pH | Temp | VFA | Alk | COD | BOD | TSS | TDS | Temp | pH | DO | MLSS | pH | Temp | COD | BOD | TSS | TDS | |
| | (4-8.5) | 40 | 1000~6000 | | 100~1000 | 500~3000 | | | 7~7.5 | 38~40 | | | 50~500 | | 100~1000 | 500~3000 | <40 | 7~7.5 | 1~3 | 2500~4000 | 6~9 | 35 | <250 | <50 | <50 | <1000 | |
| | | (°C) | mg/l | mg/l | mg/l | mg/l | | (°C) | | (°C) | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | (°C) | | mg/L | mg/L | | (°C) | mg/L | mg/L | mg/L | mg/L | |
| 03-Jun | 5.51 | 24.8 | 5220 | NA | 410 | 957 | 7.02 | 25 | 7.4 | 25.60 | 57 | 1700 | 111 | NA | 750 | 1480 | 25.3 | 7.50 | 2.4 | 1.32 | 7.6 | 25.00 | 198 | 49 | 20 | 780 | |
| 04-Jun | 5.33 | 26 | 1880 | NA | 275 | 1150 | 6.39 | 27.4 | 7.2 | 27.60 | 86 | 1050 | 124 | NA | 310 | 1400 | 27.6 | 7.50 | 2.4 | 3.92 | 7.4 | 26.80 | 102 | 46 | 34 | 765 | |
| 06-Jun | 5.55 | 24.9 | 3350 | NA | 250 | 931 | 6.80 | 25.4 | 7.4 | 25.10 | 108 | 1700 | 116 | NA | 298 | 1410 | 25.7 | 7.22 | 2.5 | 3.12 | 7.6 | 25.40 | 110 | 48 | 28 | 790 | |
| 08-Jun | 5.61 | 21.7 | 2180 | NA | 420 | 869 | 5.60 | 21.7 | 7.6 | 22.20 | 85 | 1675 | 304 | NA | 980 | 1380 | 22.1 | 7.34 | 2.7 | 2.38 | 7.7 | 21.90 | 184 | 38 | 33 | 790 | |
| 09-Jun | 5.6 | 25 | 1480 | NA | 410 | 769 | 6.04 | 25.1 | 7.4 | 25.10 | 68 | 1550 | 142 | NA | 990 | 1350 | 25.3 | 7.39 | 2.4 | 0.85 | 7.4 | 25.00 | 165 | 33 | 45 | 970 | |
| 10-Jun | 5.45 | 25.4 | 1780 | NA | 517 | 650 | 5.37 | 25.8 | 7.3 | 26.00 | 57 | 1300 | 162 | NA | 490 | 1100 | 25.9 | 7.08 | 2.6 | 2.72 | 7.3 | 25.60 | 81 | 37 | 38 | 780 | |
| 11-Jun | 6.52 | 27.3 | 2580 | NA | 320 | 1060 | 6.43 | 28.1 | 7.1 | 28.00 | 91 | 1550 | 264 | NA | 279 | 1150 | 28.3 | 7.36 | 2.6 | 1.23 | 7.4 | 28.00 | 26 | 38 | 44 | 980 | |
| 13-Jun | 7.78 | 24.7 | 1470 | NA | 297 | 1130 | 7.47 | 24.6 | 7.8 | 24.80 | 114 | 1825 | 87 | NA | 300 | 1550 | 24.7 | 7.10 | 2.8 | 3.88 | 8.0 | 24.50 | 51 | 11.9 | 29 | 450 | |
| 14-Jun | 6.21 | 26.9 | 3060 | NA | 325 | 805 | 6.49 | 26.9 | 7.6 | 27.20 | 57 | 1700 | 70 | NA | 860 | 1450 | 27.2 | 7.50 | 2.7 | 3.21 | 7.9 | 26.70 | 94 | 46.4 | 22 | 680 | |
| 15-Jun | 6.24 | 23.6 | 2580 | NA | 410 | 1360 | 6.22 | 23.7 | 7.4 | 24.20 | 85 | 1650 | 211 | NA | 987 | 1750 | 24.1 | 7.43 | 2.6 | 2.15 | 7.7 | 24.00 | 64 | 48.3 | 29 | 680 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------------------------|------|-----------|------|----------|----------|-------------|------|-----------------|-------|------|------|--------|------|----------|----------|----------|-------|------|--------------------|-----|-------------------|------|------|------|-------|
|  <div>Carlsberg Myanmar Co.Ltd.</div> | | | | | | | | | | | | | | | | | | | | Format No | | QA - P3 - F1 - 68 | | | | |
| <div>Effluent Treatment Plant</div> | | | | | | | | | | | | | | | | | | | | Issue No / Date | | 1 / 01.06.2014 | | | | |
| <div>Daily Analysis Report (Month - June 2022)</div> | | | | | | | | | | | | | | | | | | | | Revision No / Date | | 0 / 01.06.2014 | | | | |
| Date | Waste water (Equalization) | | | | | | Buffer Tank | | LESBAR Overflow | | | | | | | | Aeration | | | | | Treated water | | | | |
| | pH | Temp | COD | BOD | TSS | TDS | pH | Temp | pH | Temp | VFA | Alk | COD | BOD | TSS | TDS | Temp | pH | DO | MLSS | pH | Temp | COD | BOD | TSS | TDS |
| | (4-8.5) | 40 | 1000~6000 | | 100~1000 | 500~3000 | | | 7~7.5 | 38~40 | | | 50~500 | | 100~1000 | 500~3000 | <40 | 7~7.5 | 1~3 | 2500~4000 | 6~9 | 35 | <250 | <50 | <50 | <1000 |
| | | (°C) | mg/l | mg/l | mg/l | mg/l | | (°C) | | (°C) | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | (°C) | | mg/L | mg/L | | (°C) | mg/L | mg/L | mg/L | mg/L |
| 16-Jun | 6.01 | 24.5 | 2180 | NA | 389 | 1170 | 6.17 | 24.8 | 7.2 | 25.10 | 91 | 1700 | 295 | NA | 939 | 1250 | 25.0 | 7.50 | - | 1.32 | 7.6 | 25.30 | 50 | 33 | 30 | 780 |
| 17-Jun | 6.4 | 27.4 | 2740 | NA | 270 | 1060 | 5.87 | 27.4 | 7.4 | 27.50 | 51 | 1325 | 225 | NA | 987 | 1420 | 27.2 | 7.45 | 2.0 | 1.28 | 7.8 | 26.70 | 70 | 47 | 25 | 510 |
| 20-Jun | 7.13 | 24.2 | 2460 | NA | 310 | 1280 | 6.82 | 24.4 | 7.6 | 24.90 | 34 | 1500 | 152 | NA | 750 | 1380 | 25.1 | 7.20 | 2.8 | 2.51 | 7.8 | 24.40 | 105 | 49 | 40 | 680 |
| 21-Jun | 6.21 | 26.5 | 3100 | NA | 420 | 990 | 6.76 | 26.3 | 7.6 | 26.80 | 45 | 1500 | 139 | NA | 900 | 1350 | 27.0 | 7.44 | 2.2 | 3.15 | 7.8 | 26.50 | 46 | 38 | 38 | 760 |
| 22-Jun | 5.39 | 27 | 2880 | NA | 379 | 792 | 6.22 | 28.2 | 7.1 | 28.40 | 74 | 1260 | 212 | NA | 850 | 1260 | 28.9 | 7.50 | 2.5 | 5.43 | 7.5 | 27.90 | 66 | 37 | 22 | 590 |
| 23-Jun | 6.02 | 28.5 | 2540 | NA | 350 | 1070 | 5.86 | 28.9 | 7.1 | 29.10 | 51 | 1320 | 109 | NA | 492 | 1320 | 28.9 | 7.43 | 2.4 | 2.58 | 7.5 | 28.70 | 25 | 44 | 23 | 660 |
| 24-Jun | 5.89 | 24.3 | 3330 | NA | 2640 | 804 | 6.24 | 24.4 | 7.3 | 24.70 | 137 | 1325 | 146 | NA | 312 | 1280 | 24.7 | 7.50 | 2.1 | 1.20 | 7.6 | 24.40 | 20 | 47 | 26 | 690 |
| 25-Jun | 5.91 | 27 | 3250 | NA | 287 | 1050 | 6.19 | 27.4 | 7.6 | 27.40 | 87 | 1350 | 125 | NA | 390 | 1200 | 27.6 | 7.47 | 2.3 | 2.01 | 7.8 | 27.10 | 28 | 32 | 29 | 710 |
| 27-Jun | 6.85 | 23.4 | 3460 | NA | 420 | 1260 | 6.44 | 23.2 | 7.5 | 23.40 | 85 | 1500 | 168 | NA | 975 | 1380 | 23.3 | 7.50 | 2.1 | 1.85 | 7.8 | 23.20 | 84 | 20 | 30 | 790 |
| 28-Jun | 6.34 | 24.5 | 2420 | NA | 380 | 1140 | 6.54 | 24.8 | 7.3 | 25.10 | 74 | 1538 | 200 | NA | 804 | 1370 | 25.1 | 7.50 | - | 1.77 | 7.5 | 25.70 | 75 | 37 | 28 | 680 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------------------------|---------------------------|-----------|------|----------|----------|-------------|-------|-----------------|-------|--------|---------|--------|------|----------|----------|----------|-------|------|--------------------|------|-------------------|--------|-------|-------|--------|------|
|  | | Carlsberg Myanmar Co.Ltd. | | | | | | | | | | | | | | | | | | Format No | | QA - P3 - F1 - 68 | | | | | |
| | | Effluent Treatment Plant | | | | | | | | | | | | | | | | | | Issue No / Date | | 1 / 01.06.2014 | | | | | |
| Daily Analysis Report (Month - June 2022) | | | | | | | | | | | | | | | | | | | | Revision No / Date | | 0 / 01.06.2014 | | | | | |
| Date | Waste water (Equalization) | | | | | | Buffer Tank | | LESBAR Overflow | | | | | | | | Aeration | | | | | Treated water | | | | | |
| | pH | Temp | COD | BOD | TSS | TDS | pH | Temp | pH | Temp | VFA | Alk | COD | BOD | TSS | TDS | Temp | pH | DO | MLSS | pH | Temp | COD | BOD | TS | TDS | |
| | (4-8.5) | 40 | 1000~6000 | | 100~1000 | 500~3000 | | | 7~7.5 | 38~40 | | | 50~500 | | 100~1000 | 500~3000 | <40 | 7~7.5 | 1~3 | 2500~4000 | 6~9 | 35 | <250 | <50 | <50 | <1000 | |
| | | (°C) | mg/l | mg/l | mg/l | mg/l | | (°C) | | (°C) | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | (°C) | | mg/L | mg/L | mg/L | mg/L | | (°C) | mg/L | mg/L | mg/L |
| 29-Jun | 5.87 | 24.4 | 4200 | NA | 512 | 940 | 6.54 | 24.7 | 7.1 | 25.00 | 63 | 1575 | 128 | NA | 290 | 1470 | 24.9 | 7.49 | 2.6 | 0.98 | 7.4 | 24.50 | 137 | 34 | 30 | 880 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAX | 7.78 | 28.50 | 5220.00 | 0.00 | 2640.00 | 1360.00 | 7.47 | 28.90 | 7.8 | 29.10 | 137.00 | 1825.00 | 304.00 | 0.00 | 990.00 | 1750.00 | 28.90 | 7.50 | 2.80 | 5.43 | 8.04 | 28.70 | 198.00 | 49.00 | 45.00 | 980.00 | |
| MIN | 5.33 | 21.70 | 1470.00 | 0.00 | 250.00 | 650.00 | 5.37 | 21.70 | 7.1 | 22.20 | 34.00 | 1050.00 | 70.00 | 0.00 | 279.00 | 1100.00 | 22.10 | 7.08 | 2.00 | 0.85 | 7.30 | 21.90 | 20.00 | 11.90 | 20.00 | 450.00 | |
| AVG | 6.09 | 25.33 | 2768.57 | | 475.76 | 1011.29 | 6.36 | 25.63 | 7.4 | 25.87 | 76.19 | 1504.43 | 166.19 | ! | 663.48 | 1366.67 | 25.90 | 7.40 | 2.46 | 2.33 | 7.62 | 25.59 | 84.81 | 38.74 | 30.62 | 733.10 | |

APPENDIX G

Air Quality Result



TOTAL BUSINESS SOLUTION CO., LTD.

No. 54, Room No. 704, Waizayantar Tower, Waizayantar Road, Thingangyun Township, Myanmar

Tel: + 959 401 604 493, E-mail: tbs.myanmar@gmail.com

Air Quality Report

| | | | |
|---|--|---|------------------------|
| Client
တိုင်းတာလိုသူ အမည် | Myanmar Carlsberg Co.,Ltd | Latitude
လတ္တီတွဒ် | 17° 15' 23.28" N |
| Project Location
စီမံကိန်းတည်နေရာ | Block 3 to 13, Industrial Zone (Foreign), Bago Township | Longitude
လောင်ဂျီတွဒ် | 96° 27' 14.13" E |
| Sampling Equipment
တိုင်းတာသည့် စက်ပစ္စည်း | Haz-Scanner™ Model-EPAS | Sampling Duration
တိုင်းတာသည့် ကြာချိန် | 24-hour |
| Project Number
စီမံကိန်းအမှတ် | TBS-178/20 | Station Height
(from ground)
မြေပြင်မှ စက်တည်အမြင့် | 5 ft / 1.5 m |
| Sampling I.D
လေ့လာမှုအမှတ်စဉ် | TBS- 38 | Start Date/ Time
တိုင်းတာသည့် နေ့စွဲ/ အချိန် | 14.7.2020/
10:00 AM |
| | | End Date/ Time
ပြီးစီးသည့် နေ့စွဲ/ အချိန် | 15.7.2020/
10:00 AM |

Air Sampling Results/ လေထုတိုင်းတာစမ်းသပ်မှုအဖြေ

| No.
စဉ် | Parameters
တိုင်းတာသည့် အရည်အသွေး | Result
ရလဒ် | Unit
ယူနစ် | Sampling
Duration
ပျမ်းမျှကာလ | *Guideline value
ထုတ်လွှတ်မှုနှုန်း | Avg.Period
ပျမ်းမျှကာလ |
|------------|---|----------------|-------------------|-------------------------------------|--|---------------------------|
| 1. | Carbon dioxide (CO ₂)
ကာဗွန်ဒိုင်အောက်ဆိုက် | 362.9 | ppm | 24 hours | No Guideline = NG | - |
| 2. | Carbon monoxide (CO)
ကာဗွန်မိုအောက်ဆိုက် | 115 | µg/m ³ | 24 hours | NG | - |
| 3. | Methane (CH ₄)
မီသိန်း | 140.3 | ppm | 24 hours | NG | - |
| 4. | Nitrogen dioxide (NO ₂)
နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုက် | - | - | - | 40 * | 1-year |
| | | 75.5 | µg/m ³ | 1 hours | 200 * | 1-hour |
| 5. | Ozone (O ₃)
အိုဇုန်း | 26 | µg/m ³ | 8 hours | 100 * | 8-hour daily maximum |
| 6. | Particulate Matter (PM ₁₀)
လေထုထဲရှိ အမှုန်အမွှား | 14.8 | µg/m ³ | 24 hours | 50 * | 24-hour |
| 7. | Particulate Matter (PM _{2.5})
လေထုထဲရှိ အမှုန်အမွှား | 7.4 | µg/m ³ | 24 hours | 25 * | 24-hour |
| 8. | Sulphur dioxide (SO ₂)
ဆာလဖာဒိုင်အောက်ဆိုက် | 19.4 | µg/m ³ | 24 hours | 20 * | 24-hour |
| 9. | Volatile Organic Compound (VOCs) | 0.1 | ppb | 24 hours | NG | - |
| 10 | Temperature | 26 | °C | 24 hours | 32 ³ | - |

*Myanmar Environmental Quality Emission Guideline 2015

NG= No Guideline

³International Finance Corporation

Remark: This air quality report cannot be edited without the permission of TBS.

Field Technician

ဦးထွန်းလင်းကျော်
Assistant Environmental Manager

Analyzed by

ဒေါ်နန်းလှဝင်း
Environmental Manager

Reviewed by

ဒေါက်တာစိုးမိုးကျော်ဝင်း
Managing Director

APPENDIX H

Documents related to PCM

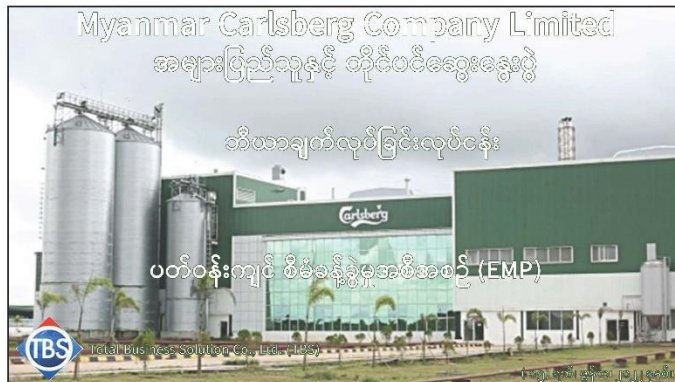
Myanmar Carlsberg Company Limited အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးပွဲ တက်ရောက်သူစာရင်း

ဒေသခံပြည်သူ

| စဉ် | အမည် | အလုပ်အကိုင် | လိပ်စာ | ဆက်သွယ်ရန်ဖုန်းနံပါတ် | လက်မှတ် |
|-----|-----------------------|-------------|---------------------|-----------------------|---------|
| 1. | Thae. Paing Phyu | HR Mgr | PCG Company | 09-758723521 | Cog. |
| 2 | Aung Min Khat | HA Assist | New Hope Farms | 09-798335761 | အ |
| 3 | U Tun Taw Myint | HR Manager | Karisma Apparel (M) | 09-458026333 | အ |
| 4 | Daw Phyu Thin Khaceng | HR Leader | " | 09-791795542 | အ |
| 5 | အောင်မိုး | HR | ပြည်သူ့အဖွဲ့အစည်း | | အ |
| 7 | Zin Thee | " | " | | အ |
| 8 | ဒါးနီ | " | " | | အ |
| 9 | Zin Min Hnang | " | " | | အ |
| 10 | ဒေါ်စောဦး | အထွေထွေ | အခြား | | အ |
| 11 | အောင် | " | " | | အ |
| 12 | အောင် | " | " | | အ |
| 13 | အောင် | " | " | | အ |
| 14 | အောင် | အထွေထွေ | " | | အ |
| 15 | အောင် | " | " | | အ |
| 16 | ဒေါ်အောင် | | | | အ |

ဌာနဆိုင်ရာ

[illegible]



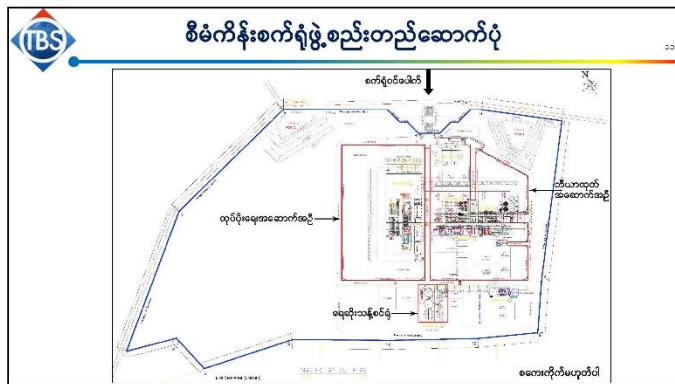
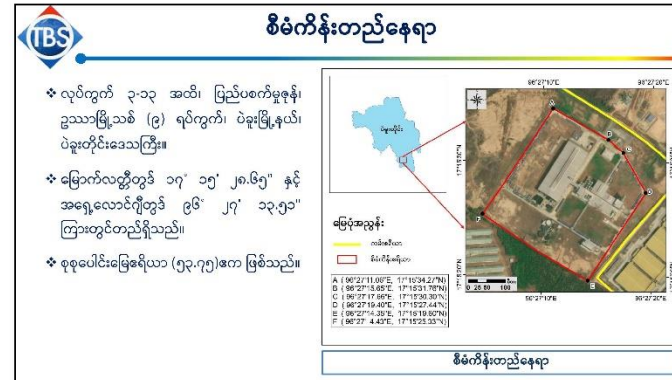
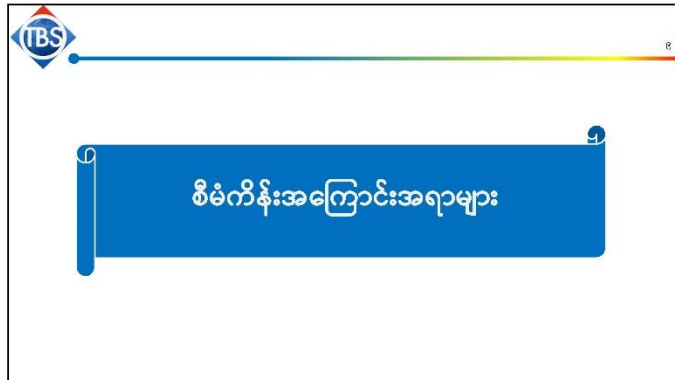
ဆွေးနွေးတင်ပြမည့် အကြောင်းအရာများ

- ❖ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ပြုလုပ်ရခြင်း၏ ရည်ရွယ်ချက်။
- ❖ စီမံကိန်းနှင့် သက်ဆိုင်သောဥပဒေ မူဘောင်များ တင်ပြခြင်း။
- ❖ စီမံကိန်းအကြောင်းအရာကို တင်ပြခြင်း။
- ❖ ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်အလက်များ လေ့လာခြင်းနှင့် တွေ့ရှိချက်များကို တင်ပြခြင်း။
- ❖ စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်အပေါ် အကျိုးသက်ရောက်မှုများအား အကဲဖြတ်ဆန်းစစ်ခြင်း။
- ❖ သက်ရောက်မှုလျှော့ချရေး အစီအစဉ်များကို တင်ပြခြင်း။
- ❖ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု နှင့် စောင့်ကြပ်ကြည့်ရှုရေး အစီအစဉ်များကို တင်ပြခြင်း။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပြုလုပ်ရခြင်း၏ရည်ရွယ်ချက်

- ❖ အဆိုပြု စီမံကိန်းကြောင့် ဖြစ်ပေါ်နိုင်သော ပတ်ဝန်းကျင် နှင့် လူမှုရေးဆိုင်ရာသက်ရောက် ထိခိုက်မှုများကို ကြိုတင်သတ်မှတ်၍ ခန့်မှန်းအကဲဖြတ်နိုင်ခြင်း။
- ❖ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာသက်ရောက်မှုများအပေါ် သက်ရောက်နိုင်မည့် ဆိုးကျိုးများကို လျှော့ချနိုင်ရန် နည်းလမ်းအစီအစဉ်များ ရေးဆွဲနိုင်ခြင်း။
- ❖ စီမံကိန်းမှ ထွက်ရှိသော ပတ်ဝန်းကျင် အရည်အသွေးများကို တိုင်းတာပြီး ရရှိလာသည့် ရလဒ်များကိုအမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ (၂၀၁၅) ဖြင့် ကိုက်ညီစွာဆောင်ရွက်ပြီး ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးအောင် ပြုလုပ်ရန်။
- ❖ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းများ ပြုလုပ်ပြီး အကြံပြုချက်သဘောထားများကို ရယူခြင်း။

စီမံကိန်းနှင့် သက်ဆိုင်သော ဥပဒေ မူဘောင်များ



| စီမံကိန်း အကြောင်းအရာ အကျဉ်းချုပ် | |
|-----------------------------------|--|
| စီမံကိန်းအမည် | Myanmar Carlsberg Company Limited |
| လုပ်ငန်း | လုပ်ကိုင်(၃-၁၃)၊ ပြည်ပစက်မှုဇုန်၊ ဥယျာဉ် (၉) ရပ်ကွက်၊ ပဲခူးမြို့နယ်၊ ပဲခူးတိုင်းဒေသကြီး။ |
| စတင်တည်ဆောက်သည့်ခုနှစ် | ၂၀၁၃ ခုနှစ် |
| လုပ်ငန်းအမျိုးအစား | ဘီယာထုတ်လုပ်သည့်စက်ရုံ |
| စီမံကိန်းဧရိယာ | စက်ရုံဧရိယာ ၅၃.၇၅ ဧက (၂၁၈,၀၀၀ စတုရန်းမီတာ)။ |
| ဆက်သွယ်ရမည့်ပုဂ္ဂိုလ် | ဦးသန့်ဇော် |
| ဖုန်းနံပါတ် | ၀၉၅ ၆၆၆၀ ၆၅၀၈ |
| ကုန်ကြမ်း | မုယော၊ ဆန်၊ တဆေး၊ သကြားနှင့် အခြားအထောက်အကူပြုပစ္စည်းများ |
| ထုတ်ကုန် | ဘီယာ |
| ဝန်ထမ်းဦးရေ | ၇၀ ဦးခန့် |
| အလုပ်ချိန် | မနက် ၈:၀၀ နာရီ မှ ညနေ ၅:၀၀ နာရီ အထိ (တနင်္လာ မှ သောကြာ)
မနက် ၈:၀၀ နာရီ မှ နေ့လယ် ၁၂:၀၀ နာရီ အထိ (စနေ) |



ထုတ်ကုန်တင်ပို့မှုအခြေအနေပြဇယား

| ထုတ်ကုန်အမျိုးအစား | ပျမ်းမျှထုတ်ကုန်ပမာဏ (နေ့စဉ်) | ခန့်မှန်းထုတ်ကုန်ပမာဏ (နှစ်စဉ်) |
|--------------------|-------------------------------|---------------------------------|
| ဘီယာစည်များ | ၁,၅၆၀ | ၅၆၉,၄၀၀ |
| ဘီယာဖန်ဘူးများ | ၅၂,၈၀၀ | ၁၉,၂၇၀,၀၀၀ |
| ဘီယာသံဘူးများ | ၇၀,၀၀၀ | ၂၆,၂၈၀,၀၀၀ |

ထုတ်ကုန်တံဆိပ် (၄) မျိုး

ဘီယာစည်များ

ဘီယာဖန်ဘူးများ

ဘီယာသံဘူးများ



လျှပ်စစ်စွမ်းအင် အသုံးပြုမှုများ

- လုပ်ငန်းဆောင်ရွက်ခြင်းအတွက် လျှပ်စစ်ဓါတ်အားကို စက်မှုဇုန်၏ လျှပ်စစ်ဓါတ်အားလိုင်းမှ ၁၁ ကေဗွီအေ အား ရှိသော ထရန်စဖော်မာဖြင့် ရယူ သုံးစွဲမည် ဖြစ်ပါသည်။
- အရေးပေါ်အခြေအနေနှင့် လျှပ်စစ်ဓါတ်အား ပြတ်တောက်ချိန် တွင် ၁,၀၁၀ ကေဗွီအေ နှင့် ၅၀၀ ကေဗွီအေ အာရုံသော ဒီဇယ်လောင်စာသုံး မီးစက် ကို တပ်ဆင်သုံးစွဲမည် ဖြစ်ပါသည်။




၁၁ ကေဗွီအေ ထရန်စဖော်မာ

ဒီဇယ် မီးစက်

ဘိုလ်လာအသုံးပြုမှု

| အမျိုးအမည် | ဖော်ပြချက် |
|---|-------------------------------------|
| အသုံးပြုသည့်ပစ္စည်း အမျိုးအစား | ရေခွေးငွေ့ဘိုလ်လာ |
| ဘိုလ်လာစနစ် | Blow down (drain water) |
| ဘိုလ်လာရေခွေးငွေ့ထုတ်လွှတ်မှု စွမ်းဆောင်ရည် အဆင့် | တစ်နာရီလျှင် ၁,၂၀၀၀ ကီလိုဂရမ်နှုန်း |
| လေဖိအားအသုံးပြုမှု | 9 Bar-gauge |
| စုစုပေါင်းစွမ်းအင်အသုံးပြုမှုပမာဏ | ၇,၃၃၄ မီဂါဝပ် |
| သုံးစွဲမှု အရေအတွက် | တစ်ခု |
| လောင်စာဆီအမျိုးအစား | ဘိုင်အိုဒီဇယ် |
| ဆီသုံးစွဲမှု ပမာဏ | တစ်လလျှင် ၆၉,၆၀၀ လီတာခန့် |



ဒီဇယ်ဘိုလ်လာ

လောင်စာဆီသိုလှောင်မှု

- လောင်စာဆီများကို မီးစက် ၁ ဘိုလ်လာနှင့် မော်တော်ယာဉ်များအတွက် အဓိက အသုံးပြုသည်။
- စက်ရုံ၏ လောင်စာဆီအသုံးပြုနှုန်းမှာ ပျမ်းမျှအားဖြင့် တစ်လလျှင် ၇၇ ကီလိုလီတာခန့်ဖြစ်သည်။
- ၂၇ ကီလိုလီတာခန့် ဓါတ်ဆီသိုလှောင်ကန် နှင့် ၇၀ ကီလိုလီတာခန့် ဒီဇယ်သိုလှောင်ကန် တစ်ခုစီရှိပါသည်။




ဓါတ်ဆီသိုလှောင်ကန်

ဒီဇယ်သိုလှောင်ကန်

မီးဘေးအန္တရာယ်အတွက် စီစဉ်ထားရှိမှု

- မီးငြိမ်းသတ်ရေး အထောက်အကူပြု ပစ္စည်းများအနေဖြင့် မီးသတ်ဆေးဘူး၊ မီးသတ်ရေပိုက်ခေါင်း၊ မီးသတ်ရေပိုက် စသည်တို့ကို မီးသတ်ဦးစီးဌာန၏ လမ်းညွှန်ချက်နှင့်ညီ စီစဉ်ထားရှိပါသည်။
- ၎င်းအပြင် စက်ရုံတွင်း အရေးပေါ် မီးငြိမ်းသတ်ရန်အတွက် အပူချိန်အာရုံခံကိရိယာပါသော အလိုအလျောက် ရေဖြန်းစနစ်ကို တပ်ဆင်ထားရှိပါသည်။
- ဝန်ထမ်းများကိုလည်း မီးသတ်ပစ္စည်းများ ကျွမ်းကျင်စွာ အသုံးပြုနိုင်ရန် စက်ရုံအရေးပေါ်မီးသတ်အဖွဲ့ ဖွဲ့စည်း၍ မီးသတ်သင်တန်းများ လေ့ကျင့်သင်ကြား ပေးထားသည့်အပြင် သက်ဆိုင်ရာ မီးသတ်သင်တန်းဆင်း လက်မှတ်များလည်း ရရှိထားပါသည်။






မီးသတ်ရေပိုက်ခေါင်း

မီးသတ်ဆေးဘူး

မီးသတ်အင်ဂျင်

စက်ရုံအရေးပေါ်မီးသတ်အဖွဲ့

စွန့်ပစ်ရေများ

- ❖ ကုန်ထုတ်လုပ်ငန်းသုံးစွန့်ပစ်ရေများ
 - ✓ တိယာချက်လုပ်ခြင်း လုပ်ငန်းမှ ထွက်ရှိသော စွန့်ပစ်ရေပမာဏမှာ ပျမ်းမျှအားဖြင့် တစ်နှစ်လျှင် ၁,၇၂၀,၀၀၀ လီတာခန့် ရှိနိုင်ပါသည်။
 - ✓ စက်ရုံမှထွက်ရှိသော စွန့်ပစ်ရေများကို သန့်စင်ရန် တစ်နေ့လျှင် ၁,၀၀၀ ကျပ်စီသာ သန့်စင်နိုင်သော ရေဆိုးသန့်စင်စက်ရုံကို တည်ဆောက်ထားပါသည်။
 - ✓ သန့်စင်ပြီးရေများကို သတ်မှတ် လမ်းညွှန်ချက်များနှင့် ကိုက်ညီမှု ရှိမရှိ စစ်ဆေးရန် online monitoring system ကိုလည်း တပ်ဆင်ထားပါသည်။
 - ✓ ရေဆိုးသန့်စင်စက်ရုံမှ ထွက်ရှိသော သန့်စင်ပြီးရေ၏ ၁၀% ကို မီးလန်းစိုပြေရေး လုပ်ငန်းများတွင် ပြန်လည်အသုံးပြု၍ ကျန်ရှိသော ရေများကို စည်ပင်ရှေ့တံမြောင်းသို့ စွန့်ပစ်ပါသည်။



ရေဆိုးသန့်စင်စက်ရုံ

စွန့်ပစ်ရေများ

- ❖ ဝန်ထမ်းသုံးစွန့်ပစ်ရေများ
 - ✓ ဝန်ထမ်းများ အသုံးပြုရန်အတွက် သန့်စင်ခန်း နှင့် မိလ္လာကန်များကို စနစ်တကျ တည်ဆောက် ထားရှိပါသည်။
 - ✓ ဝန်ထမ်းများ အသုံးပြုရာမှ ထွက်ရှိလာသော စွန့်ပစ်ရေ ပမာဏမှာ တစ်နေ့လျှင် ၈,၅၀၀ လီတာခန့် ရှိနိုင်ပါသည်။
 - ✓ စက်ရုံမိလ္လာကန်မှ ထွက်ရှိသော အညစ်အကြေး များကို ရေဆိုးသန့်စင်စက်ရုံ သို့ ပိုက်လိုင်းများမှ တဆင့် ပေးပို့မည်ဖြစ်ပါသည်။



အမျိုးသားသန့်စင်ခန်း

အမျိုးသမီးသန့်စင်ခန်း

စွန့်ပစ်အမှိုက်များ

- ❖ လုပ်ငန်းလည်ပတ်စဉ်ထွက်ရှိသော အမှိုက်များ
 - ✓ သံဘူးခွံအပျက်အစီးများ၊ ကတ္တူစက္ကူပုံးများ၊ သစ်သားခွံအပျက်အစီးများ စသည်တို့ပါဝင်ပါသည်။
- ❖ ဝန်ထမ်းများ အသုံးပြုသော အမှိုက်များ
 - ✓ ပလတ်စတစ်အိတ်များ၊ ရေဘူးခွံများ၊ စက္ကူများ နှင့် စားကြင်းစားကျန်များ စသည်တို့ပါဝင်ပါသည်။
- ❖ အန္တရာယ်ရှိသော စွန့်ပစ်အမှိုက်များ
 - ✓ စက်သုံးဆီအကြွင်းအကျန်များ။
 - ✓ ကုန်ထုတ်လုပ်ငန်းမှထွက်သော ဓာတုဆေးများပါဝင်သည့် အနည်အနှစ်များ။
 - ✓ ဘတ္တရီအဟောင်းများ နှင့် မီးချောင်းများ။
 - ✓ ဓာတုပစ္စည်းထည့်ရာတွင်သုံးသော အသုံးပြုပြီး ပုံးခွံများ။
 - ✓ ဖန်ပုလင်းကွဲအပိုင်းအစများ စသည်တို့ပါဝင်ပါသည်။
- ❖ လစဉ် အမှိုက်ထွက်ရှိမှုပမာဏမှာ ၁၈ တန် မှ ၂၅ တန်ကြားတွင်ရှိပါသည်။

ဝန်ထမ်းများအတွက် စီစဉ်ထားရှိမှု

- ❖ စီမံကိန်းလုပ်ငန်းအတွက် လိုအပ်သော လုပ်ငန်းများတွင် တာဝန် လမ်းဆောင်ရန် ဆေးခန်းများကို ဦးစားပေးဆောက်လုပ်ခြင်း။
- ❖ ဝန်ထမ်းများ ကြံ့ခိုင်ရေးအတွက် ဖယ်ရီများစီစဉ်ထားရှိခြင်း။
- ❖ လုပ်ငန်းကျွမ်းကျင်မှုဆိုင်ရာနှင့် နည်းယဉ်းဆိုင်ရာသင်တန်းများ လေ့ကျင့်သင်ကြားပေးခြင်း။
- ❖ မှာမကျန်ဖြစ်ပါက အလေ့မျိုး ကုသနိုင်ရန်အတွက် စက်ရုံတွင်း ဆေးပေးခန်း ထားရှိခြင်းနှင့် လိုအပ်ပါက ဆေးခန်းသို့ ပို့ဆောင်ပေးခြင်း။
- ❖ အလုပ်တာဝန်ပေါ် မူတည်ပြီး လိုအပ်သော တစ်ကိုယ်ရည်သုံး အကာအကွယ်ပစ္စည်းများ (PPE) ပံ့ပိုးပေးခြင်း။
- ❖ လုပ်ငန်း စွမ်းဆောင်ရည်ပေါ် မူတည်ပြီး နှစ်စဉ် အပိုဆုများ ချီးမြှင့်ခြင်း။
- ❖ ဝန်ထမ်းများအတွက် အခြားသော လိုအပ်ချက်များရှိပါက လုပ်ငန်း အခြေအနေပေါ်မူတည်၍ ပြည့်ဆည်း ဆောင်ရွက်ပေးသွားမည် ဖြစ်ပါသည်။



ရုံးဖယ်ရီ

ဆေးပေးခန်း

PPE

PPE

ပတ်ဝန်းကျင်ဆိုင်ရာ အခြေခံ အချက်အလက်များ တင်ပြခြင်း

ပတ်ဝန်းကျင်အရည်အသွေးတိုင်းတာသည့်နယ်ပယ်များ

- မြေအသုံးချမှု
- လေထုအရည်အသွေး တိုင်းတာခြင်း
- ရေထုအရည်အသွေး တိုင်းတာခြင်း
- ဆူညံသံ တိုင်းတာခြင်း
- တုန်ခါမှု တိုင်းတာခြင်း
- အလင်း နှင့် အပူချိန် တိုင်းတာခြင်း

ENVIRONMENTAL MONITORING

မြေအသုံးချမှု လေ့လာခြင်း

| စဉ် | အမည် | ဧရိယာ (ပတ်တာ) | ရာခိုင်နှုန်း (%) |
|------------|--------------------|---------------|-------------------|
| ၁။ | စက်မှုနှင့်နယ်မြေ | ၁၆၆.၁၂ | ၅၂.၈၁ |
| ၂။ | မြေလွတ် မြေရိုင်း | ၈၉.၆၈ | ၂၈.၅၁ |
| ၃။ | စိုက်ပျိုးမြေဧရိယာ | ၃၂.၇၅ | ၁၀.၄၁ |
| ၄။ | လူနေဧရိယာ | ၁၃.၄၃ | ၄.၂၇ |
| ၅။ | လမ်း | ၅.၈၈ | ၁.၈၇ |
| ၆။ | ရေထုထည် | ၄.၃၉ | ၁.၃၉ |
| ၇။ | ဘာသာရေး နယ်မြေ | ၁.၆၉ | ၀.၅၄ |
| ၈။ | အိမ်သားရေးနယ်မြေ | ၁.၆၁ | ၀.၄၉ |
| စုစုပေါင်း | | ၃၁၃.၉၄ | ၁၀၀ |

မြေအသုံးချမှု

စီမံကိန်းဧရိယာအနီး မြေအသုံးချမှု အခြေအနေပြ မြေပုံ

လေထုအရည်အသွေး တိုင်းတာခြင်း

- လေထုအရည်အသွေးတိုင်းတာခြင်းကိုစီမံကိန်းဧရိယာအတွင်း မြောက်လတ္တီတွဒ် ၁၇° ၁၅' ၂၃.၂၈" ၊ အရှေ့လောင်ဂျီတွဒ် ၉၆° ၂၇' ၁၄.၁၃" တွင် ၂၄ နာရီကြာ တိုင်းတာခဲ့ ပါသည်။
- လေထုအရည်အသွေးရလဒ်များကိုအမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) နှင့် နှိုင်းယှဉ်ထားရှိပါသည်။

လေထုအရည်အသွေး တိုင်းတာသည့် နေရာပြမြေပုံ

လေထုအရည် အသွေးတိုင်းတာသည့်ပုံ

| လေထုအရည်အသွေး တိုင်းတာခြင်း ရလဒ်များ | | | | | |
|--------------------------------------|----------------------------------|-------|-------|-----------------|------------------------|
| စဉ် | တိုင်းတာသည့် အရည်အသွေး | ရလဒ် | ယူနစ် | ပြုစီမံကိန်းကာလ | *ထုတ်လွှတ်နှုန်းနှုန်း |
| ၁။ | ကာဗွန်ဒိုင်အောက်ဆိုဒ် | ၃၆၂.၄ | ppm | ၂၄ hours | - |
| ၂။ | ကာဗွန်မိုနောက်ဆိုဒ် | ၁၁၅ | μg/m³ | ၂၄ hours | - |
| ၃။ | နီသီနီး | ၁၄၀.၃ | ppm | ၂၄ hours | - |
| ၄။ | နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ် | ၇၅.၅ | μg/m³ | ၁ hour | ၂၀၈ |
| ၅။ | အိုဇုန်း | ၂၆ | μg/m³ | ၈ hours | ၁၀၀ |
| ၆။ | လေထုထဲရှိ အမှုန်အမွှား(PM10) | ၁၄.၈ | μg/m³ | ၂၄ hours | ၂၄ |
| ၇။ | လေထုထဲရှိ အမှုန်အမွှား(PM2.5) | ၇.၄ | μg/m³ | ၂၄ hours | ၂၄ |
| ၈။ | ဆာလဖာဒိုင်အောက်ဆိုဒ် | ၁၉.၄ | μg/m³ | ၂၄ hours | ၂၄ |
| ၉။ | Volatile Organic Compound (VOCs) | ၁.၁ | ppb | ၂၄ hours | - |
| ၁၀။ | လေထုထဲရှိ အမှုန်အမွှား | ၁.၂၂ | mg/s | ၂၄ hours | ၂၄ |
| ၁၁။ | လေထုထဲရှိ အမှုန်အမွှား | ၇၈ | Deg | ၂၄ hours | ၂၄ |
| ၁၂။ | အပူချိန် | ၂၆ | °C | ၂၄ hours | ၂၄ |

* ရလဒ်များကိုအမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအစည်းအဝေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅)နှင့်နှိုင်းယှဉ်ရာတွင်အရည်အသွေးများမှာလမ်းညွှန်ချက်အတွင်း ရှိပါသည်။

ရေအရည်အသွေး တိုင်းတာခြင်း

- ရေထုအရည်အသွေးတိုင်းတာခြင်းကိုစီမံကိန်းအရိယာအတွင်း အလိုလျောက် တိုင်းတာဖော်ပြသည့် စက်ဖြင့် တိုင်းတာခြင်း အပြင် မြေခွဲခန်းတွင်စစ်ဆေးရန်လည်း စီမံကိန်းမှ ရေစုစုမှာကို ယူခဲ့ပါသည်။
- မြောက် လတ္တီတွဒ် ၁၇° ၁၅' ၂၄.၇၇" ၊ အရှေ့ လောင်ဂျီတွဒ် ၉၆° ၂၇' ၁၀.၇၂" (စွန့်ပစ်ရေ) ။
- မြောက် လတ္တီတွဒ် ၁၇° ၁၅' ၂၂.၈၆" ၊ အရှေ့ လောင်ဂျီတွဒ် ၉၆° ၂၇' ၁၀.၇၅" (သန့်စင်ပြီးစွန့်ပစ်ရေ) ။
- ရေအရည်အသွေး ရလဒ်များကို အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) ဖြင့် နှိုင်းယှဉ်ထားပါသည်။




ရေစုစုမှာကောက်ယူသည့် နေရာပြမြေပုံ


| စွန့်ပစ်ရေဆိုးအရည်အသွေး တိုင်းတာခြင်း ရလဒ်များ | | | | |
|--|---|----------------------------------|--------|---|
| စဉ် | အရည်အသွေး ညွှန်းကိန်း | ရလဒ်အမြေ (AVG) Equalization Tank | ယူနစ် | အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) |
| Online Monitoring System | | | | |
| ၁။ | ရေအိုင်အောက် (pH) | ၇.၈ | ၇.၇၁ | S. U |
| ၂။ | အပူချိန် | ၂၄.၉၇ | ၂၅.၀၈ | °C |
| ၃။ | စီမံကိန်းရာ အောက်ဆီဂျင် လိုအပ်ချက် (BODs) | - | ၄၅.၁၂ | mg/L |
| ၄။ | ဆာလဖာဒိုင်အောက်ဆိုဒ်လို့အမ်ချက် (COD) | ၃၁၅၅.၀၆ | ၉၄.၈၆ | mg/L |
| ၅။ | ဆိုင်ရိုက်ဆူအယ်(TSS) | ၃၆၆.၂၈ | ၁၅၈.၆၁ | mg/L |
| ၆။ | ပေါက်ကွဲအမှုန်(TDS) | ၁၁၅၈ | ၁၀၇၀ | mg/L |
| မောက်နိုက်ရပ်စ်သစ်ချက် | | | | |
| ၇။ | ဆိုင်ယာနိုက် (Free Cyanide) | ၀.၀၁ | ၀.၀၁ | mg/L |
| ၈။ | ဖိုစဖိုရပ်စ် (Phosphorous) | ၀.၀၅ | ၀.၂ | mg/L |
| ၉။ | သံ သတ္တုဓာတ် (Iron) | ၄.၇ | ၀.၁ | mg/L |
| ၁၀။ | ပိသတ္တုဓာတ် (Lead) | မရှိ | မရှိ | mg/L |
| ၁၁။ | နောက်ကွီလီ(Turbidity) | ၁၈၆ | ၅ | FAU |

ဆည်သံတိုင်းတာခြင်း

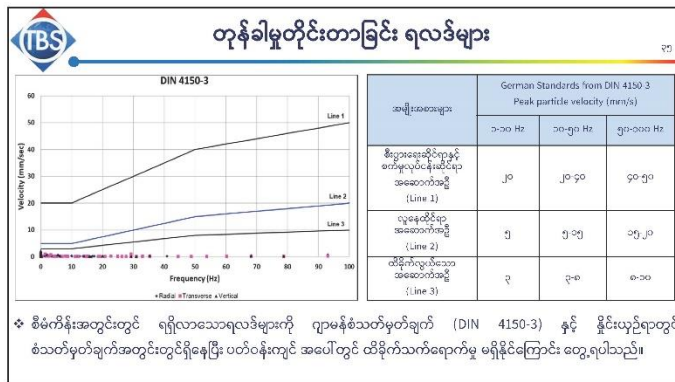
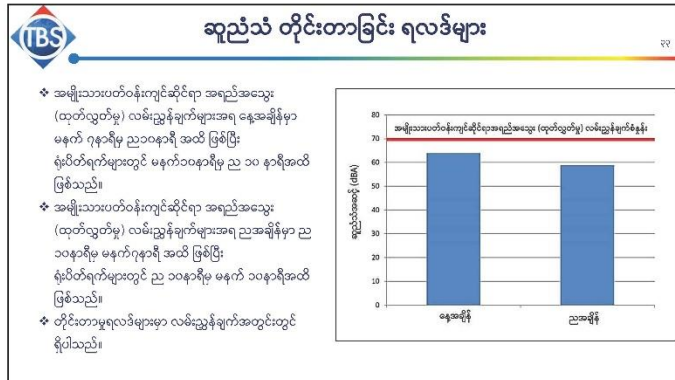
- အသံဆည်မှတို့ စီမံကိန်းအတွင်းတွင် မြောက်လတ္တီတွဒ် ၁၇° ၁၅' ၂၆.၃၇" ၊ အရှေ့လောင်ဂျီတွဒ် ၉၆° ၂၇' ၁၄.၃၈" ။ နေအချိန် နှင့် ညအချိန် ဟူ၍ (၂) ချိန်ခွဲ၍ တိုင်းတာခဲ့ပါသည်။
- ရလဒ်များကို အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) နှင့် နှိုင်းယှဉ်ခဲ့ပါသည်။

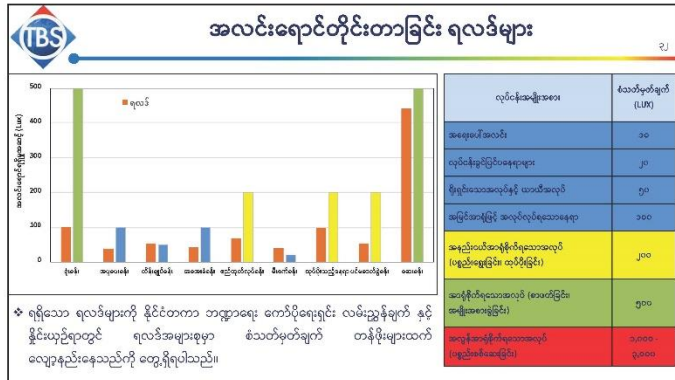


ဆည်သံတိုင်းတာသည့်နေရာပြမြေပုံ



ဆည်သံ တိုင်းတာသည့်ပုံ





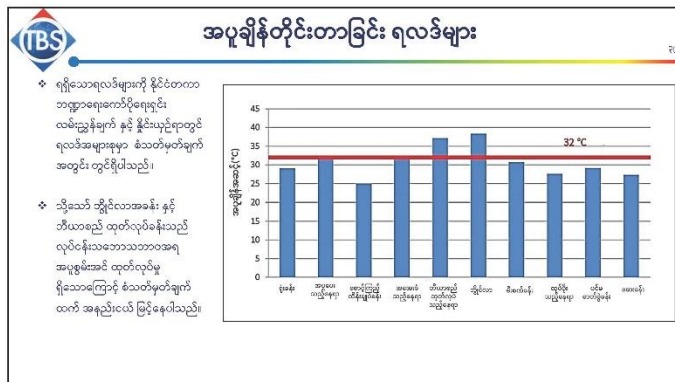
အပူချိန်တိုင်းတာခြင်း

❖ စီမံကိန်းအတွင်းတွင် အပူချိန်ကို နေရာ ၁၀ ခု တွင်တိုင်းတာခဲ့ ပါသည်။

❖ ရရှိသောရလဒ်များကိုနိုင်ငံတကာဘဏ္ဍာရေးကော်ပိုရေးရှင်း လမ်းညွှန်ချက် နှင့် နှိုင်းယှဉ်ခဲ့ပါသည်။

အပူချိန်တိုင်းတာခြင်း

| စဉ် | တိုင်းတာသည့်နေရာ | တည်နေရာ | |
|-----|---------------------------|-----------------|-------------------|
| | | မြောက်လတ္တီတွဒ် | အရှေ့လောင်ဂျီတွဒ် |
| ၁။ | ရုံအနီး | ၁၇°၁၅'၂၈.၆၅" | ၉၆°၂၇'၁၁.၃၈" |
| ၂။ | အပူပေးသည့်နေရာ | ၁၇°၁၅'၂၆.၇၁" | ၉၆°၂၇'၁၆.၂၅" |
| ၃။ | စောင့်ကြည့်ထိန်းချုပ်ခန်း | ၁၇°၁၅'၂၈.၁၂" | ၉၆°၂၇'၁၅.၄၃" |
| ၄။ | အဆေးခန်းသည့်နေရာ | ၁၇°၁၅'၂၈.၀၃" | ၉၆°၂၇'၁၅.၂၆" |
| ၅။ | ဘီယာစည် ထုတ်လုပ်သည့်နေရာ | ၁၇°၁၅'၂၈.၁၆" | ၉၆°၂၇'၁၀.၇၀" |
| ၆။ | သိုက်လား | ၁၇°၁၅'၂၂.၆၉" | ၉၆°၂၇'၁၄.၂၈" |
| ၇။ | စီစက်ခန်း | ၁၇°၁၅'၂၆.၀၈" | ၉၆°၂၇'၁၅.၇၅" |
| ၈။ | ထုပ်ပိုးသည့်နေရာ | ၁၇°၁၅'၂၈.၀၅" | ၉၆°၂၇'၁၁.၃၅" |
| ၉။ | ပစ်ဖောက်ခန်း | ၁၇°၁၅'၂၇.၃၅" | ၉၆°၂၇'၁၅.၆၃" |
| ၁၀။ | ဆေးခန်း | ၁၇°၁၅'၃၀.၃၂" | ၉၆°၂၇'၁၆.၃၈" |



စီမံကိန်းကြောင့် ပတ်ဝန်းကျင် ထိခိုက်မှု အကဲဖြတ်ဆန်းစစ်ခြင်း

[illegible]

စီမံကိန်းကြောင့် ပတ်ဝန်းကျင် ထိခိုက်မှုကို
လျော့ချရမည့်အစီအစဉ်များ

|  | <h1>ဆုညည် နှင့် တုန်ခါမှုများ</h1> | | |
|---|--|---|--|
| သက်ဆောင်မှုကဏ္ဍ | သက်ဆောင်မှု ဖြစ်စေသည့် အကြောင်းအရာများ | သက်ဆောင်မှုများကြောင့် ဖြစ်ပေါ်နေသည့် တိုက်ခိုက်မှုများ | လေ့လာမှုပုံစံအစီအစဉ် |
| <p>တည်ဆောက်ရေး နှင့် ဖိတ်ခေါ်ဆောင်ကဏ္ဍ</p> | <ul style="list-style-type: none"> ယာယီဖွဲ့စည်းဆောင်ရွက်မှုများ နှင့် ဆောက်လုပ်ရေးလုပ်ငန်းများ ယာယီကြိုမည့်အချိန်များအတွက် အချိန်ကွပ်ကဲမှု တည်ဆောက်ခြင်းနှင့် ဖိတ်ခေါ်ဆောင်မှု လုပ်ငန်းများ အရွယ်အသားပေးသည့်သော စက်ရုံများအား အသုံးပြုခြင်း | <ul style="list-style-type: none"> ဆုညည်နှင့် တုန်ခါမှုများကြောင့် အခြား အချိန်ကွပ်ကဲမှု ဖြစ်ပေါ်ခြင်း အိမ်ထောင်ရေးနှင့် ဆက်စပ်ဆောင်ရွက် ဖြစ်ပေါ်ခြင်း ဆက်လက်လုပ်ဆောင်မှု အစီအစဉ်များ ကြောင့် အချိန်ကွပ်ကဲမှု ဖြစ်ပေါ်ခြင်း | <ul style="list-style-type: none"> ဆုညည်နှင့် တုန်ခါမှုများသော စက်ရုံတည်များကို အသုံးပြုခြင်း စက်ရုံတည်များကို ဖွဲ့စည်းဆောင်ရွက်ခြင်း ယာယီဖွဲ့စည်းဆောင်ရွက်မှုများ ပြုလုပ်ခြင်းဖြင့် ဆုညည်နှင့် တုန်ခါမှုကို ဆွဲချနိုင်ခြင်း ဆုညည်နှင့် တုန်ခါမှုများ ပြုလုပ်ခြင်းအတွက် အချိန် ညီညာစွာ ကုန်သွယ်ခြင်း ဆုညည်နှင့် တုန်ခါမှုများသောစက်ရုံတည်များကို နှစ်ဆက်တစ်ဆက်လက် အသုံးပြုခြင်း |
| <p>လုပ်ငန်းလုပ်ဆောင်မှု ကဏ္ဍ</p> | <ul style="list-style-type: none"> စက်ရုံတည်များ အသုံးပြုခြင်းနှင့် ဆောက်လုပ်မှုများအတွက် အသုံးပြုခြင်း | <ul style="list-style-type: none"> အကြောင်းအရာအချို့အား အသုံးပြုခြင်း ယာယီဖွဲ့စည်းဆောင်ရွက်ခြင်း စက်ရုံတည်များ အသုံးပြုခြင်း အချိန်ကွပ်ကဲမှု ဖြစ်ပေါ်ခြင်း ကျန်းမာရေးဆိုင်ရာ ဖြစ်ပေါ်ခြင်း | <ul style="list-style-type: none"> ဆုညည်နှင့် တုန်ခါမှုများသောစက်ရုံတည်များကို အသုံးပြုခြင်း စက်ရုံတည် ကိရိယာများ အသုံးပြုခြင်း ဖြစ်ပေါ်ခြင်း ဆုညည်နှင့် တုန်ခါမှုများ ဖြစ်ပေါ်သည့် အချိန်ကွပ်ကဲမှု အသုံးပြုခြင်း အချိန်ကွပ်ကဲမှု ဖြစ်ပေါ်ခြင်း ဆုညည်နှင့် တုန်ခါမှုများ ဖြစ်ပေါ်သည့် အချိန်ကွပ်ကဲမှု အသုံးပြုခြင်း |

[illegible]

| အနိမ့်ဆုံးထွက်ရှိမှု | | | |
|---|--|--|---|
| သက်ရောက်မှုကာလ | သက်ရောက်မှု ဖြစ်ပေါ်စေသည့် အကြောင်းအရာများ | သက်ရောက်မှုများကြောင့် ဖြစ်ပေါ်စေနိုင်သော ဝိရိဇ္ဈာန်များ | ရွှေ့ရာရမည့်အစီအစဉ် |
| <ul style="list-style-type: none"> လုပ်ငန်းလည်ပတ် စဉ်ကာလ | <ul style="list-style-type: none"> ဘီယာသွင်းလုပ်ရန်အတွက် ကဆေးကဆေးလုပ်ငန်းလည်ပတ်နေပါ။ ရေဆိုးသန့်စေရန်စက်မှ ထွက်ရှိသော အဆူအနံ့များမှ အနံ့မရှိမှုအားကန့်ချနိုင်ခြင်း။ | <ul style="list-style-type: none"> အနိမ့်ဆုံးထွက်ရှိမှုများကြောင့် ခေါင်းကိုက်ခြင်း၊ ဆော့ဆေးရုံခြင်းစသော ကျန်းမာရေးဆိုင်ရာ ပြဿနာများဖြစ်ပေါ်နိုင်ခြင်း။ | <ul style="list-style-type: none"> ရက်အတွင်း ကောင်းမွန်သော စေ့ငြိမ်းစေသည့်ထွက်ကုန်အနုစု လုပ်ငန်းလုပ်ကိုင်စဉ်တွင် MPF များကို အလုပ်သမားများ ထောက်ပံ့ပေးခြင်း။ အနံ့ဆိုး ထွက်ရှိနိုင်သော ခရုရာမများတွင် လုံခြုံစေရန်ထားခြင်း။ |

[illegible]

လူမှုစီးပွားအပေါ်ကောင်းကျိုးသက်ရောက်မှု

- ဒေသခံများနှင့် အနီးဝန်းကျင် အတွက် အလုပ်အကိုင် အခွင့်အလမ်းများ ရရှိစေခြင်း။
- ထို့ကြောင့် ပတ်ဝန်းကျင် ပြည်သူလူထုအတွက် ဒေသအတွင်း လူမှုစီးပွား အခြေအနေများ တိုးတက်လာ နိုင်ခြင်း။
- နိုင်ငံဝင်ငွေ တိုးတက် စေနိုင်ခြင်း။
- ခေတ်စီစက်ပစ္စည်းများကို ကျွမ်းကျင်စွာအသုံးပြုနိုင်သော အရည်အချင်းရှိသော ဝန်ထမ်းများ ထွက်ပေါ်လာခြင်း။
- လူမှုအကျိုးတူ ပူးပေါင်းပါဝင်မှု (CSR) အစီအစဉ်များ ပြုလုပ်ခြင်းဖြင့် လူမှုဝန်းကျင်အပေါ် ကောင်းကျိုးများ ရရှိစေခြင်း။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်

ပတ်ဝန်းကျင်လေ့လာစောင့်ကြည့်မှုအစီအစဉ်

လုပ်ငန်းလည်ပတ် ဆောင်ရွက်သည့်ကာလအတွက် EMP အစီအစဉ်ကိုစနစ်တကျရေးဆွဲရမည်။

စောင့်ကြည့်မှုစနစ်ဆေးပြီး ရလဒ်များကို ဝီရိယ ကောင်းမွန်စွာ ရန် ပြန်လည် ပြင်ဆင် ရေးဆွဲ ရမည်။

စီမံကိန်း အကောင်အထည်ဖော်သူမှ ဆောင်ရွက်ရပါမည်။

ဌာနဆိုင်ရာ၊ စီမံကိန်းအကောင်အထည်ဖော်သူ၊ အနီးအနားရှိ ဒေသခံများ၊ စောင့်ကြည့် စစ်ဆေးပေးရမည်။

လုပ်ငန်းလည်ပတ်စဉ် ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြည့်ကြည့်ရှုရမည့်အစီအစဉ်

| စောင့်ကြည့်ကြည့်ရှုရမည့် အကြောင်းအရာများ | စောင့်ကြည့်ကြည့်ရှုရမည့် အမျိုးအမည်များ | စောင့်ကြည့်ကြည့်ရှုရမည့် နေရာ | အကြိမ် အရေအတွက် | ခန့်မှန်းအသုံးစရိတ် (ကျပ်) | တာဝန်ယူရမည့်အဖွဲ့အစည်း |
|--|---|---|--|----------------------------|------------------------------------|
| မဝလုံအရည်အသွေး | CO2, CO, C14, NO2, O3, PM10, PM2.5, SO2, VOCs | စီမံကိန်းလုပ်ငန်းခွင်အတွင်း | လုပ်ငန်းဆောင်ရွက် စဉ်တစ်နှစ် (၂) ကြိမ် | ၂,၀၀၀,၀၀၀ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့အစည်း |
| ကျည်သံ | ကျည်သံ (dBA) scale | လုပ်ငန်းခွင်အတွင်း | လုပ်ငန်းဆောင်ရွက် စဉ်တစ်နှစ် (၂) ကြိမ် | ၃,၀၀၀,၀၀၀ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့အစည်း |
| ကုန်ခဲမှု | Radial, Transverse, Vertical | လုပ်ငန်းခွင်အတွင်း | လုပ်ငန်းဆောင်ရွက် စဉ်တစ်နှစ် (၂) ကြိမ် | ၃,၀၀၀,၀၀၀ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့အစည်း |
| စွန့်ပစ်အမျိုးအမည် | လုပ်ငန်းခွင်မှ ထွက်ရှိသော အမှိုက်များ၊ ပစ္စည်းထုပ်ပိုးမှု၊ လွှတ်ချထားသော အမှိုက်များ၊ ဝန်ဆောင်မှုပေးသည့် ပစ္စည်းများ၊ လွှတ်ချထားသော အမှိုက် များ၊ စွန့်ပစ်ပစ္စည်းများ | အမှိုက်ပုံ၊ ဟာပီ အမှိုက် နှင့် ပစ်ခတ် | နှစ်စဉ် | ၂,၀၀၀,၀၀၀ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့အစည်း |
| စွန့်ပစ်ပစ္စည်း | လုပ်ငန်းခွင်မှ ထွက်ရှိသော အမှိုက်နှင့် ပစ္စည်းများ၊ လွှတ်ချထားသော အမှိုက် များ၊ စွန့်ပစ်ပစ္စည်းများ | အမှိုက်ပုံ၊ ဟာပီ အမှိုက် နှင့် ပစ်ခတ် | နှစ်စဉ် | ၃,၀၀၀,၀၀၀ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့အစည်း |
| လုပ်ငန်းခွင် အသုံးပြုမှု | မတော်တဆ ထိခိုက်မှု မှတ်တမ်းများ | စက်ရုံ နှင့် လုပ်ငန်း ဆောင်ရွက်သော နေရာများ | နှစ်စဉ် | ၅,၀၀၀,၀၀၀ | လုပ်ငန်းခွင်အကောင်အထည်ဖော်ရေးအဖွဲ့ |

| ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ဖော်ဆောင်ရန် ဘဏ္ဍာငွေလျာထားမှု | | | |
|--|------------------------------------|--|------------------------------------|
| ပတ်ဝန်းကျင်ဆိုင်ရာလုပ်ငန်းများ | | ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေးဆိုင်ရာ လုပ်ငန်းများ | |
| ပတ်ဝန်းကျင်လေ့လာ စောင့်ကြည့်ရေးလုပ်ငန်းစဉ် | ခန့်မှန်းအသုံးစရိတ် ကျပ် (နှစ်စဉ်) | ပတ်ဝန်းကျင်လေ့လာ စောင့်ကြည့်ရေးလုပ်ငန်းစဉ် | ခန့်မှန်းအသုံးစရိတ် ကျပ် (နှစ်စဉ်) |
| ပတ်ဝန်းကျင်အရည်အသွေး တိုင်းတာခြင်း၊ စောင့်ကြည့်မှုခြင်း | ၇,၀၀၀,၀၀၀ | လုပ်ငန်းခွင်သုံးကာကွယ်ရေး ဝတ္ထုများ | ၃,၀၀၀,၀၀၀ |
| အရေးပေါ်အခြေအနေ | ၅၀၀,၀၀၀ | ကျန်းမာရေးအထောက်အပံ့ | ၅၀၀,၀၀၀ |
| သက်ဆိုင်ရာသင်တန်းများပို့ချခြင်း | ၅၀၀,၀၀၀ | စီးသတ်ပစ္စည်းများ | ၅၀၀,၀၀၀ |

❖ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ဖော်ဆောင်ရန် လျာထားသော ဘဏ္ဍာငွေ မလုံလောက်ပါက စီမံကိန်းဆောင်ရွက်သူမှ လိုအပ်သလို ခြည့်စွက် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

❖ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီရင်ခံစာ တွင် ပတ်ဝန်းကျင် စောင့်ကြည့်မှုရရှိရေး အစီအစဉ်များနှင့် စီမံခန့်ခွဲမှု အစီအစဉ်များကို ထည့်သွင်း ရေးသားထားပါသည်။


❖ စောင့်ကြည့်မှု အစီအစဉ်မှရလဒ်များကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) သို့ ဂီလ တစ်ကြိမ် တင်ပြရမည် ဖြစ်ပါသည်။

| လူမှုအကျိုးတူ ပူးပေါင်းပါဝင်မှု နှင့် ဒေသဖွံ့ဖြိုးရေးအတွက် ပါဝင်မည့် အစီအစဉ်များ | | | |
|--|--|---------------------------------|---|
| လူမှုအကျိုးတူ ပူးပေါင်းပါဝင်မှု အကြောင်းအရာများ | ဆောင်ရွက် မည့်အရာများ | ထည့်သွင်းရမည့် အမြောက်အမြား (%) | ရည်ရွယ်ချက် |
| ကျန်းမာရေး | • အလုပ်သမားများနှင့် မိသားစုများအတွက် ကျန်းမာရေး စောင့်ကြည့်မှုများ | ၁၅ | • စီမံကိန်းလုပ်ငန်းတွင် လုပ်ကိုင်သောအလုပ်သမားများ ကျန်းမာရေး ကောင်းမွန်စွာ ရောက်ရှိနိုင်ရန်။ |
| ပညာရေး | • ပညာရေး အဆင့်အတန်း နှင့် လူမှုအဖွဲ့အစည်းများ အသိပညာများ ဖြန့်ဝေပေးခြင်း
• စာသင်ကျောင်းများအတွက် လိုအပ်သော နေရာတွင် အလှူငွေ လှူဒါန်းပေးခြင်း | ၁၅ | • ပိုမိုကောင်းမွန်သော လူမှုအသိပညာ ဖြန့်ဝေရန်။
• လူငယ်တို့၏ ပညာသင်ကြားနိုင်စေရန်။ |
| ဒေသဖွံ့ဖြိုးရေး | • ခေမာစံပြည့်လုံမှုများသို့ လျှင်မြန်စေခြင်း
• စီမံကိန်းအနီးလတ်ဝန်းကျင် လမ်းခြင်ပေးခြင်း
• ဆက်လက်ဆောင်ရွက်ရန် လိုအပ်သော အသိပညာများဖြန့်ဝေခြင်း | ၁၅ | • ခေမာတွင်း ပရဟိတလုပ်ဆောင်ရေးသော ခေမာအဖွဲ့အစည်းများ တာဝန်ယူဆောင်ရွက်နိုင်စေရန်။
• ခေမာတွင်းလုပ်ဆောင်ရေးသော အများအပြားဖြင့် လုပ်ငန်းများတွင် ဝန်ထမ်းများအား တက်ကြွစွာ ပူးပေါင်းဆောင်ရွက်နိုင်စေရန်။
• အလုပ်သမားများအတွက် လူမှုအဖွဲ့အစည်းနှင့် ပတ်သက်၍ ဆောင်ရွက်ရန်များနှင့် နားလည်မှုများရှိရန်။
• ဝင်ရောက်ဆိုင်ရာ နောင်ယက်မှုများနှင့် လုပ်ငန်းခွင်အတွင်း နိုင်ငံတော်စီမံခန့်ခွဲမှု လုပ်ဆောင်မှုများကို တားဆီးကာကွယ်ခြင်းများ လုပ်ဆောင်နိုင်ရန်။ |


ကျေးဇူးတင်ပါသည်။

APPENDIX I

Certificate of Chemical and Related Substances

| | | | | |
|--|---|--|---------------------|-------------|
| 
Central Leading Board | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများအန္တရာယ်မှ
တားဆီးကာကွယ်ရေး
ဗဟိုကြီးကြပ်ရေးအဖွဲ့ | | ပုံစံ | ၈ |
| | | | ဓာတုပစ္စည်းအရေအတွက် | ၁၂၄ (မျိုး) |
| | | | သက်တမ်း | ၂ နှစ် |

ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများ မှတ်ပုံတင်လက်မှတ်
 မှတ်ပုံတင်လက်မှတ်အမှတ်စဉ် --- ၀၀၀၄၇၁ ---
 (နည်းဥပဒေ ၂၄)



ရက်စွဲ၊ ၂၀၂၀ ပြည့်နှစ်၊ မေလ ၁၇ ရက်

၁။ ၄ - ၅ - ၂၀၂၀ ရက်စွဲပါ လျှောက်လွှာအမှတ် ၀၀၀၅၀၆ ဖြင့် မှတ်ပုံတင်ခွင့်ပြုရန် လျှောက်ထားသော ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများအား မြန်မာနိုင်ငံ အတွင်း အသုံးပြုရန် မှတ်ပုံတင်ပြီးဖြစ်သည်။

၂။ တာဝန်ခံလျှောက်ထားသူ၏အမည် Mr.Christoph Vavrik

၃။ နိုင်ငံသားစိစစ်ရေးကတ်ပြားအမှတ် U 0207224

၄။ အမြဲတမ်းနေရပ်လိပ်စာ No.332(A), Pyay Lane Thwe North Myaynigone, San Chaung Township, Yangon.


၅။ ဆက်သွယ်ရန်ဖုန်းနံပါတ် သို့မဟုတ် ဖက်စ်(Fax)နံပါတ် သို့မဟုတ် e-mail လိပ်စာ ၀၁-၂၃၀၄၄၆၆
zinnwe.aung@carlsberg.asia

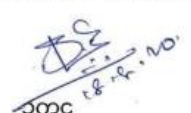
၆။ လုပ်ငန်းလိပ်စာ No.3-13, Naung Inn Village, Foreign Industrial Zone Area, Bago Township, Bago Region.

၇။ ဆက်သွယ်ရန်လုပ်ငန်းဖုန်းနံပါတ် သို့မဟုတ် ဖက်စ်(Fax)နံပါတ် သို့မဟုတ် e-mail လိပ်စာ

၈။ မှတ်ပုံတင်ခွင့်ပြုသောဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများ နောက်ဆက်တွဲပါအတိုင်းဖြစ်ပါသည်။
(နောက်ဆက်တွဲစာရင်းအရ)

၉။ သက်တမ်းကုန်ဆုံးမည့် နေ့ရက် ၁၇ - ၅ - ၂၀၂၂




 ဗဟိုကြီးကြပ်ရေးအဖွဲ့

စည်းကမ်းချက်များ

မှတ်ပုံတင်လက်မှတ်ရရှိသူသည် အောက်ဖော်ပြပါ စည်းကမ်းချက်များကို လိုက်နာဆောင်ရွက်ရမည်-

- ၁။ ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများအန္တရာယ်မှ တားဆီးကာကွယ်ရေးဥပဒေအရ ထုတ်ပြန်သော နည်းဥပဒေ၊ အမိန့်ကြော်ငြာစာ၊ အမိန့်၊ ညွှန်ကြားချက်နှင့် လုပ်ထုံးလုပ်နည်းများပါ စည်းကမ်းချက်များကို လိုက်နာခြင်း၊
- ၂။ မှတ်ပုံတင်ထားသည့်စာရင်းတွင် ပါရှိသော်လည်း အသုံးမပြုလိုသော ပစ္စည်းများရှိပါက ဗဟိုကြီးကြပ်ရေးအဖွဲ့သို့ အသိပေးတင်ပြခြင်း၊
- ၃။ မှတ်ပုံတင်ထားသည့်စာရင်းတွင် မပါရှိသည့်ပစ္စည်းများ အသုံးပြုခြင်း၊ မှတ်ပုံတင်ထားသည့် ပစ္စည်းများ၏ ကုန်အမှတ်တံဆိပ် သို့မဟုတ် အမျိုးအမည် ပြောင်းလဲခြင်း၊ ပါဝင်မှုပမာဏ ပြောင်းလဲခြင်း၊ အရည်အသွေးအာမခံချက်နှင့် စံချိန်စံညွှန်းပြောင်းလဲခြင်းနှင့် အမျိုးသားအဆင့် ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများစာရင်းတွင် မပါရှိသည့်ပစ္စည်းသစ်များ အသုံးပြုရန်ရှိပါက မှတ်ပုံတင်လက်မှတ် ထပ်မံလျှောက်ထားခြင်း၊
- ၄။ လုပ်ငန်းနှင့်စပ်လျဉ်းသည့် အန္တရာယ်များကို တင်ပြခြင်း၊
- ၅။ လုပ်ငန်းလုပ်ကိုင်ရာတွင် အန္တရာယ်ကင်းရှင်းစေရန် ဆောင်ရွက်ထားရှိခြင်း၊
- ၆။ ပတ်ဝန်းကျင်ထိခိုက်မှုမရှိစေရန် စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျသန့်စင်ပြီးမှ စွန့်ပစ်ခြင်း သို့မဟုတ် စနစ်တကျ စုပုံထားခြင်း။

**ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများအန္တရာယ်မှ
တားဆီးကာကွယ်ရေး
မပျံ့ကြီးကြပ်ရေးအဖွဲ့**

ကုမ္ပဏီ/လုပ်ငန်းအမည်

Myanmar Carlsberg Co.,Ltd.

မှတ်ပုံတင်ခွင့်ပြုသည့် ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများအမည်စာရင်း

| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|-----|---|--|
| 1. | 1-10 phenanthroline monohydrate | 1,000 gram |
| 2. | 2-Phenylethanol | 500 ml |
| 3. | 95% Alcohol | 60 gallon |
| 4. | Acetone | 5 Liter |
| 5. | Agar Technical | 500 gram |
| 6. | Ammonium Buffer Solution, pH 10 | 6 Liter |
| 7. | Ammonium Chloride | 500 gram |
| 8. | Anaerobic indicator, BR0055B , 10/pk (Thermo Scientific) | 72 pkt |
| 9. | Anaerogen TM 2.5L , 10sachets/pk | 72 pkt |
| 10. | Aquasnap ATP surface test,100test/pk | 6 pkt |
| 11. | Bacteriological Peptone | 500 gram |
| 12. | Barium Chloride | 1,000 gram |
| 13. | BOD, Oxygen Reaction Bottle | 24 pcs |
| 14. | Bouffant Cap (Hair Net) | 12 pcs |
| 15. | Bromocresol Green | 25 gram |
| 16. | Bromothymol Blue | 100 gram |
| 17. | Buffer solution, pH 10.00 | 12 Liter |



| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|-----|--|--|
| 18. | Buffer Solution, pH 4.0 | 12 Liter |
| 19. | Buffer Solution, pH 7.0 | 12 Liter |
| 20. | Calcium Carbonate | 1,000 gram |
| 21. | Calcium Oxide | 1,000 gram |
| 22. | Calcon Metal Indicator | 200 gram |
| 23. | Charcoal | 1,000 gram |
| 24. | COD (Mercury Free Reagent) | 150 pcs |
| 25. | Coliforms 100 Readycult with Sterilised vessels | 48 pkt |
| 26. | Copper(II)sulfate pentahydrate | 250 gram |
| 27. | Cycloheximide (Actidione) | 100 gram |
| 28. | Cycloheximide (Actidione), 0.1 % | 200 ml |
| 29. | D(+)- Glucose monohydrate anhydrate | 500 gram |
| 30. | Di sodium hydrogen phosphate dehydrate | 250 gram |
| 31. | DPD free Chlorine Reagent (100 Pillows / 1 Pack) | 12 Pack |
| 32. | EDTA | 100 gram |
| 33. | EDTA Solution, 0.02 N | 6 Liter |
| 34. | Eriochrome Black-T indicator | 50 gram |
| 35. | Ferrous Sulfate | 100 gram |
| 36. | Formaldehyde Solution | 3 Liter |
| 37. | Gram's counterstain Safranin solution | 500 ml |
| 38. | Gram's Crystal violet solution | 500 ml |
| 39. | Gram's Decolourizer solution | 500 ml |
| 40. | Gram's Iodine solution | 500 ml |



| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|-----|---|--|
| 41. | Hydrochloric Acid | 5 Liter |
| 42. | Hydroxylamine Hydrochloride | 1,000 gram |
| 43. | Iodine | 250 gram |
| 44. | Iso Octane | 60 Liter |
| 45. | Kieselghur Powder | 50 kg |
| 46. | Macconkey Agar | 1,000 gram |
| 47. | Malt Extract Agar | 500 gram |
| 48. | Mercury sulphate | 500 gram |
| 49. | Methyl Orange Indicator | 100 gram |
| 50. | Methyl Orange Solution , 125 ml/Bottle | 4 bottle |
| 51. | Methylene Blue | 250 gram |
| 52. | O-phenylenediamine | 200 gram |
| 53. | Phenolphthalein 1% Indicator ,125 ml / Bottle | 6 bottle |
| 54. | Phenolphthalein Indicator | 100 gram |
| 55. | Plate Count Agar | 1,000 gram |
| 56. | Potassium Chloride | 500 gram |
| 57. | Potassium Chloride | 250 gram |
| 58. | Potassium Dichromate | 1 bottle |
| 59. | Potassium dihydrogen phosphate | 500 gram |
| 60. | Potassium Hydroxide, KOH | 3,000 gram |
| 61. | Potassium Iodide | 250 gram |
| 62. | Potassium permanganate | 250 gram |
| 63. | P-rosanline Hydrochloride | 250 gram |



| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|-----|---|--|
| 64. | Silver Nitrate | 2 bottle |
| 65. | Silver Sulphate | 200 gram |
| 66. | Sodium Chloride | 500 gram |
| 67. | Sodium Chloride | 3 bottle |
| 68. | Sodium Hydroxide Pellets Purified | 12 Kg |
| 69. | Sodium Pyrosulphite or Sodium bisulphate | 250 gram |
| 70. | Sodium Thiosulphate Pentahydrate Purified | 500 gram |
| 71. | Starch Soluble | 250 gram |
| 72. | Sterikon plus bioindicator | 60 pcs |
| 73. | Sulphuric Acid about 98% Pure | 5 liter |
| 74. | Tri-sodium citrate dihydrate | 250 gram |
| 75. | Tween 80 | 1,000 ml |
| 76. | Universal Beer Agar | 24 bottle |
| 77. | Yeast Extract Agar | 500 gram |
| 78. | Zinc sulfate heptahydrate | 500 gram |
| 79. | Caramel Color | 8,039 Kg |
| 80. | Potassium Metabisulphate | 400 Kg |
| 81. | Calcium Chloride | 4,000 Kg |
| 82. | Calcium Sulphate | 1,500 Kg |
| 83. | Zinc Sulphate | 51 Kg |
| 84. | Real | 2,160 Kg |
| 85. | Phosphoric Acid | 12,000 Kg |
| 86. | Nitric Acid | 630 Kg |



| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|------|---|--|
| 87. | Citric Acid | 3,343 Kg |
| 88. | Caustic | 101,501 Kg |
| 89. | DILAC Z VF13 | 480 Kg |
| 90. | SPECTRUM VT36 | 2,000 Kg |
| 91. | Optisperse PO5068 | 480 Kg |
| 92. | Foodpro ST8026 | 2,880 Kg |
| 93. | Ascorbic Acid | 25 Kg |
| 94. | OXODES (HCL9%) | 10,800 Kg |
| 95. | OXONET (Sodium Chlorite 7.5) | 10,800 Kg |
| 96. | Stabilon WT | 2,640 Kg |
| 97. | Horolith FL | 15,708 Kg |
| 98. | Oxonia-150 | 2,244 Kg |
| 99. | Stabilon TF | 2,400 Kg |
| 100. | DryExx | 4,800 Kg |
| 101. | Topax 66 | 420 Kg |
| 102. | Nalco 7320 | 800 Kg |
| 103. | Nalco 7330 | 300 Kg |
| 104. | Nalco 3DT222 | 1,380 Kg |
| 105. | Nalco ST70 | 300 Kg |
| 106. | Nalco 90001 | 420 Kg |
| 107. | PermaClean® 191T | 12 Kg |
| 108. | PermaClean® 33 | 24 Kg |
| 109. | PermaClean® 67 | 24 Kg |



| စဉ် | ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းအမျိုးအမည် | တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏ
(ကီလိုဂရမ် သို့မဟုတ် လီတာ) |
|------|---|--|
| 110. | PermaClean® 77 | 24 Kg |
| 111. | PermaClean® 11 | 24 Kg |
| 112. | Nalco780 | 300 Kg |
| 113. | Nnalco 2310 | 25 Kg |
| 114. | TOPAX 75 | 16 Kg |
| 115. | Lubodrive EC | 600 Kg |
| 116. | Polix XT | 25 Kg |
| 117. | Nitric Acid | 360 Kg |
| 118. | Citric Acid | 2,904 Kg |
| 119. | Carrafloacid | 480 Kg |
| 120. | Lactic Acid | 2,400 Kg |
| 121. | Bacstop | 300 Kg |
| 122. | Zetag | 420 Kg |
| 123. | Ultrasnap | 6.5 Kg |
| 124. | Potassium Metabisulphate | 2,250 α Kg |

မှတ်ချက်။ လုပ်ငန်းလိုအပ်ချက်အရ တစ်နှစ်အသုံးပြုရန် ခန့်မှန်းပမာဏမှာပြောင်းလဲမှုရှိနိုင်ပါသည်။



**Myanmar Carlsberg Co., Ltd မှ ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့၊ ဥဿာမြို့သစ်(၉)ရပ်ကွက်၊ ပြည်ပစက်မှုနယ်၊ အကွက်အမှတ် (၃-၁၃)၊ မြေဧရိယာ (၉၃.၇၅) ပေါ်တွင်
ဘီယာချက်လုပ်ခြင်းလုပ်ငန်း အကောင်အထည်ဖော် ဆောင်ရွက်ရန်အတွက် တင်ပြလာသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) တွင် အောက်ပါ
အချက်အလက်များအား ပြင်ဆင်ဖြည့်စွက်၍ ပြန်လည်တင်ပြရန်**

| စဉ် | သုံးသပ်အကြံပြုချက်များ | ပြန်လည်ပြင်ဆင်ဖော်ပြချက် |
|-----|--|---|
| ၁။ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ (၂၇-၆-၂၀၁၉) ရက်စွဲပါ စာအမှတ်၊ အီးအိုင်အေ - ၁/၄ - က (၁၂၉၅/၂၀၁၉) ဖြင့် အရက်ချက်လုပ်ငန်းများအတွက် ရေဆိုးသန့်စင် စနစ်ပစ်စနစ် (Wastewater Treatment System) နှင့် စွန့်ပစ်ရည်အရည်အသွေးအား အချိန်နှင့်တပြေးညီ တိုင်းတာစောင့်ကြပ် ကြည့်ရှုစနစ် (Real Time Wastewater Online Monitoring System) တပ်တင် အကောင်အထည်ဖော်ဆောင်ရွက်ရန် ညွှန်ကြားထားပြီး ဖြစ်သောကြောင့် စီမံကိန်းတွင် Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား တပ်ဆင်အသုံးပြု လျက်ရှိ/မရှိနှင့် အသုံးပြုလျက်ရှိပါက ၎င်း Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား အသုံးပြု ဆောင်ရွက်လျက် ရှိသည့် စွန့်ပစ်ရေစီမံခန့်ခွဲမှုအစီအစဉ် အသေးစိတ်ကို အခန်း (၇)၊ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ် (Environmental Management Plan) အခန်းတွင် အသေးစိတ် ထည့်သွင်းဖော်ပြရန်၊ | ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ (၂၇-၆-၂၀၁၉) ရက်စွဲပါ စာအမှတ်၊ အီးအိုင်အေ - ၁/၄ - က (၁၂၉၅/၂၀၁၉) ဖြင့် အရက်ချက် လုပ်ငန်းများအတွက် ရေဆိုးသန့်စင်စနစ်ပစ်စနစ် (Wastewater Treatment System) နှင့် စွန့်ပစ်ရည်အရည်အသွေးအား အချိန်နှင့် တပြေးညီ တိုင်းတာစောင့်ကြပ် ကြည့်ရှုစနစ် (Real Time Wastewater Online Monitoring System) တပ်ဆင် အကောင်အထည် ဖော်ဆောင်ရွက်ရန် ညွှန်ကြားထားသည့်အပြင် စီမံကိန်း တွင်လည်း Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား အသုံးပြုလျက် ရှိပါသည်။ သို့ဖြစ်ပါ၍ ၎င်း Wastewater Treatment System နှင့် Real Time Wastewater Online Monitoring System တို့အား အသုံးပြု ဆောင်ရွက်လျက်ရှိသည့် စွန့်ပစ်ရေစီမံခန့်ခွဲမှု အစီအစဉ် အသေးစိတ်ကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (Environmental Management Plan) အခန်းရှိ အခန်း (၇)၊ အပိုဒ် (၇.၅)၊ အပိုဒ်ခွဲ (၇.၅.၁) တွင် အသေးစိတ် ထည့်သွင်းဖော်ပြ ထားပါသည်။ Real Time Wastewater Online Monitoring Results များကိုလည်း အခန်း (၄)၊ |

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| | | အပိုဒ် (၄.၈)၊ အပိုဒ်ခွဲ (၄.၈.၁) တွင် အသေးစိတ် ထည့်သွင်းဖော်ပြထားပါသည်။ |
| ၂။ | အခန်း (၇)၊ အခန်းခွဲ (၇.၉)၊ ဇယား(၇-၃) စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ် အခန်းတွင် လေ၊ ရေ၊ မြေအရည်အသွေးနှင့် ဆူညံသံတို့ကို စောင့်ကြည့်တိုင်းတာစစ်ဆေးမည့် နေရာများ၏ Latitude၊ Longitude အမှတ်များကို ဖော်ပြ၍ မြေပုံဖြင့်ထည့်သွင်း ဖော်ပြရန်၊ | အခန်း (၇)၊ အပိုဒ် (၇.၉)၊ ဇယား(၇-၃) စောင့်ကြပ်ကြည့်ရှုမည့် အစီအစဉ်အခန်းတွင် လေ၊ ရေ ၊ တုန်ခါမှု နှင့် ဆူညံသံတို့ကို စောင့်ကြည့်တိုင်းတာစစ်ဆေးမည့် နေရာများ၏ Latitude၊ Longitude အမှတ်များနှင့် မြေပုံများကို ပြန်လည်ထည့်သွင်း ၍ ဖြည့်စွက်ဖော်ပြ ထားပါသည်။ |
| ၃။ | စက်ရုံတွင်း စက်ဆီ၊ ချောဆီ၊ အမဲဆီများနှင့် ဘေးအန္တရာယ်ရှိသော ပစ္စည်းများယိုဖိတ်မှု ဖြစ်ပွားပါက စုပ်ယူနိုင်သော ပစ္စည်းများဖြစ်သည့် လွှစာမှုန့်၊ သဲ စသည်တို့အား အဆင်သင့်ထားရှိ ဆောင်ရွက်မည် ဖြစ်ကြောင်းကို အခန်း (၅)၊ ထိခိုက်နိုင်မှုနှင့် လျော့ပါးစေရေးနည်းလမ်းများ အခန်းတွင် ထည့်သွင်းဖော်ပြရန်၊ | စက်ရုံတွင်း စက်ဆီ၊ ချောဆီ၊ အမဲဆီများနှင့် ဘေးအန္တရာယ်ရှိသော ပစ္စည်းများယိုဖိတ်မှု ဖြစ်ပွားပါက စုပ်ယူနိုင်သော ပစ္စည်းများဖြစ်သည့် လွှစာမှုန့်၊ သဲ စသည်တို့အား အဆင်သင့်ထားရှိ ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်အဆင့်ဆင့်ကို အခန်း(၅)၊ အပိုဒ် (၅.၅) နှင့် (၅.၆) ရှိ ဇယား(၅-၅) နှင့် (၅-၆)၊ ထိခိုက်နိုင်မှုနှင့် လျော့ပါးစေရေး နည်းလမ်း များ အခန်းတွင် ထည့်သွင်းဖော်ပြထားပါသည်။ |
| ၄။ | စီမံကိန်းဆောင်ရွက်ခြင်းမှထွက်ရှိမည့် စွန့်ပစ်ရေများအား အမျိုးသား ပတ်ဝန်းကျင် ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များပါ အပိုဒ် (၂.၃.၁.၈)၊ ဘီယာနှင့် အရက်ချက်လုပ်ငန်းအတွက် စွန့်ထုတ်အရည် လမ်းညွှန်တန်ဖိုးများနှင့်အညီ လိုက်နာ ဆောင်ရွက်မည်ဖြစ်ကြောင်းကို အခန်း (၂)၊ မူဝါဒ၊ ဥပဒေနှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်များအခန်းတွင် ထည့်သွင်း ဖော်ပြရန်၊ | စီမံကိန်းဆောင်ရွက်ခြင်းမှထွက်ရှိမည့် စွန့်ပစ်ရေများအား အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် များပါ အပိုဒ် (၂.၃.၁.၈)၊ ဘီယာနှင့် အရက်ချက်လုပ်ငန်းအတွက် စွန့်ထုတ်အရည် လမ်းညွှန်တန်ဖိုးများနှင့် အညီ လိုက်နာ ဆောင်ရွက်မည် ဖြစ်ကြောင်းကို အခန်း (၂)၊ အပိုဒ် (၂.၄)၊ အပိုဒ်ခွဲ (၂.၄.၁) ရှိ မူဝါဒ၊ ဥပဒေနှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်များ အခန်းတွင် ထည့်သွင်း ဖော်ပြထားပါသည်။ |

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| ၅။ | စီမံကိန်းလုပ်ငန်း ပိတ်သိမ်းခြင်းအဆင့်တွင် ဆောင်ရွက်ရမည့်လုပ်ငန်းများအား ထည့်သွင်းဖော်ပြရန်၊ | စီမံကိန်းလုပ်ငန်း ပိတ်သိမ်းခြင်းအဆင့်တွင် ဆောင်ရွက်ရမည့် လုပ်ငန်းများအား အခန်း (၇)၊ အပိုဒ် (၇.၈) တွင် အသေးစိတ် ထည့်သွင်းဖော်ပြထားပါသည်။ |
| ၆။ | စီမံကိန်းဆောင်ရွက်ခြင်းကြောင့် ထိခိုက်ခံစားရသည့် ဒေသခံများ၏ ပညာရေး၊ ကျန်းမာရေးစောင့်ရှောက်မှု၊ အခြေခံအဆောက်အအုံ၊ အလုပ်အကိုင်ခန့်ထားခြင်း၊ ရေရှည်လူမှုစီးပွားရေးဖွံ့ဖြိုးတိုးတက်ရေးတို့ ဆောင်ရွက်ပေးမည့် ဒေသဖွံ့ဖြိုးရေး အစီအစဉ်အတွက် အသုံးပြုမည့် လျာထားအသုံးစရိတ်၊ တာဝန်ယူဆောင်ရွက်မည့် အဖွဲ့နှင့် ဘီယာချက်လုပ်ငန်းကြောင့် ဒေသခံပြည်သူများအပေါ် ထိခိုက်မှုများရှိပါက ဖြေရှင်းဆောင်ရွက်နိုင်ရန် ဒေသခံပြည်သူများနှင့် တွေ့ဆုံဆွေးနွေးမှုများကို (၃)လ (၁)ကြိမ် သို့မဟုတ် (၆)လ (၁)ကြိမ် စသည်ဖြင့် ကျင်းပဆောင်ရွက်၍ ဒေသခံများနှင့် ချိတ်ဆက်ဆောင်ရွက်သွားရန်၊ | စီမံကိန်းဆောင်ရွက်ခြင်းကြောင့် ထိခိုက်ခံစားရသည့် ဒေသခံများ၏ ပညာရေး၊ ကျန်းမာရေးစောင့်ရှောက်မှု၊ ခြေခံအဆောက်အအုံ၊ အလုပ်အကိုင်ခန့်ထားခြင်း၊ ရေရှည် လူမှုစီးပွားရေး ဖွံ့ဖြိုးတိုးတက်ရေးတို့ဆောင်ရွက်ပေးမည့် ဒေသဖွံ့ဖြိုးရေး အစီအစဉ် အတွက် အသုံးပြုမည့် လျာထားအသုံးစရိတ်၊ တာဝန်ယူ ဆောင်ရွက်မည့် အဖွဲ့နှင့် သက်ဆိုင်သော အချက်အလက်များကို အခန်း(၇)၊ အပိုဒ် (၇.၁၀) တွင် အသေးစိတ်ဖော်ပြထားပါသည်။ ဘီယာချက် လုပ်ငန်းကြောင့် ဒေသခံပြည်သူများအပေါ် ထိခိုက်မှုများ ရှိပါက ဖြေရှင်းဆောင်ရွက်နိုင်ရန် စက်ရုံအနေဖြင့် အကြံပြု စာပုံးများထားရှိ၍ ဒေသခံပြည်သူများထံမှ အကြံပြုစာ (သို့မဟုတ်) တိုင်ကြားစာများ ရှိပါက သက်ဆိုင်ရာ ဒေသခံပြည်သူများနှင့် တွေ့ဆုံ ဆွေးနွေးမှုများကို (၃)လ (၁)ကြိမ် သို့မဟုတ် (၆)လ (၁)ကြိမ် စသည်ဖြင့် လိုအပ်သလို ကျင်းပ၍ ဒေသခံများနှင့် ချိတ်ဆက် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ |
| ၇။ | အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းတွင် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ၁၃-၇-၂၀၂၀ ရက်နေ့ ထုတ်ပြန်စာအရ ကျန်းမာရေးနှင့် အားကစားဝန်ကြီးဌာနမှ ထုတ်ပြန်ထားသည့် လိုက်နာဆောင်ရွက်ရမည့် စည်းကမ်းချက်များနှင့်အညီ လူ(၅)ဦး ထက်မပိုသော၊ ဒေသခံကိုယ်စားလှယ်များကို ဦးစားပေးဖိတ်ကြား သင့်ပါကြောင်းနှင့် ဒေသခံ အစုအဖွဲ့ | အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းတွင် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ၁၃-၇-၂၀၂၀ ရက်နေ့ ထုတ်ပြန်စာအရ ကျန်းမာရေးနှင့် အားကစားဝန်ကြီးဌာနမှ ထုတ်ပြန်ထားသည့် လိုက်နာဆောင်ရွက်ရမည့် စည်းကမ်းချက်များနှင့်အညီဆောင်ရွက်၍ စီမံကိန်းနှင့် ပတ်သက်သော သတင်းအချက်အလက် များကို ရှင်းလင်းဖော်ပြပြီး |

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| | ကိုယ်စားလှယ်(၅)ဦးထက်ရှိပါက တွေ့ဆုံဆွေးနွေးသည့်အကြိမ်ရေ တိုးမြှင့်ဆောင်ရွက်ရန်၊ ရပ်ကွက်/ကျေးရွာ အုပ်ချုပ်ရေးမှူးရုံးများတွင် ဗွီဒီယိုစကားများ အသုံးပြု၍ စီမံကိန်းနှင့် ပတ်သက်သော သတင်းအချက်အလက်များကို ရှင်းလင်းဖော်ပြပြီး ဒေသခံများ၏ စိုးရိမ်ပူပန်မှုများ၊ တောင်းဆိုမှုများ၊ အကြံပြုချက် များအား အခြေခံ၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းနှင့် သတင်းအချက်အလက် ထုတ်ဖော်ခြင်း (Public Consultation & Disclosure) အခန်းအား ပူးတွဲ(၂)တွင် ဖော်ပြထားသည့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာနမှ ထုတ်ပြန်ထားသည့် လမ်းညွှန်ချက်များအတိုင်း လိုက်နာဆောင်ရွက်ပြီး ရေးသားပြုစု၍ ထည့်သွင်း ဖော်ပြရန်၊ | ဒေသခံများ၏ စိုးရိမ်ပူပန်မှုများ၊ တောင်းဆိုမှုများ၊ အကြံပြုချက်များအား အခြေခံ၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်းနှင့် သတင်းအချက်အလက်ထုတ်ဖော်ခြင်း (Public Consultation & Disclosure) အခန်းအား ပူးတွဲ(၂)တွင် ဖော်ပြထားသည့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာနမှ ထုတ်ပြန်ထားသည့် လမ်းညွှန်ချက်များ အတိုင်း လိုက်နာဆောင်ရွက်ပြီး ရေးသားပြုစု၍ အခန်း (၆) တွင် အသေးစိတ်ထည့်သွင်း ဖော်ပြထားပါသည်။ |
| ၈။ | စီမံကိန်းအဆိုပြုသူအနေဖြင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပါ အခန်း တစ်ခုချင်းဆီ အလိုက် အကောင်အထည်ဖော် ဆောင်ရွက်ရမည့် လုပ်ငန်းများအား ကတိကဝတ်ပြု ဇယားဖြင့် ဖော်ပြရန်၊ | ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပါ အခန်း တစ်ခုချင်းဆီအလိုက် အကောင်အထည်ဖော် ဆောင်ရွက်ရမည့် လုပ်ငန်းများအား ကတိကဝတ်ပြုဇယားဖြင့်အစီရင်ခံစာ၏ ကတိကဝတ်၊ စာမျက်နှာ (၁)တွင် ပြန်လည်ဖြည့်စွက်ဖော်ပြထားပါသည်။ |
| ၉။ | စီမံကိန်းအဆိုပြုသူအနေဖြင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ပါ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးလုပ်ငန်းများအတွက် ထည့်သွင်းဖော်ပြထားသည့် လျာထားအသုံးစရိတ်များနှင့်ပတ်သက်၍ သီးခြားငွေစာရင်းဖွင့်လှစ်ထားသော အထောက်အထား အချက်အလက်ဖြင့် နောက်ဆက်တွဲတွင် ထည့်သွင်းဖော်ပြရန်၊ | စီမံကိန်းအဆိုပြုသူအနေဖြင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ပါ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးလုပ်ငန်းများအတွက် ထည့်သွင်းဖော်ပြထားသည့် လျာထားအသုံးစရိတ် များနှင့်ပတ်သက်၍ လက်ရှိကာလတွင် စီမံကိန်းအဆိုပြုသူအနေဖြင့် သီးခြားငွေစာရင်း ဖွင့်လှစ်ထားခြင်း မရှိသေးသော်လည်း နောင်အချိန်တွင် ဆက်လက်ဆောင်ရွက်၍ ဖော်ပြသွားမည်ဖြစ်ပါသည်။ |