VEGAGERÐIN

Framkvæmda-fréttir 11. tbl. /16

Ármann Kr. Ólafsson bæjarstjóri í Kópavogi, Dofri Eysteinsson Suðurverki og Hreinn Haraldsson vegamálastjóri fjarlægja lokunarmerki við nýjan kafla Arnarnesvegar.

Nýr hluti Arnarnesvegar tekinn í notkun

Áður birt á vegagerdin.is 15.11.2016

Umferð var hleypt á nýjan kafla Arnarnesvegar (411) þriðjudaginn 15. nóvember en reiknað er með að vegurinn létti mikið á umferðarþunga á Fífuhvammsvegi í Kópavogi. Það voru Hreinn Haraldsson vegamálastjóri og Ármann Kr. Ólafsson bæjarstjóri í Kópavogi sem hleyptu umferðinni á með aðstoð Dofra Eysteinssonar frá Suðurverki sem var verktakinn ásamt Loftorku.

Verkið fólst í því að leggja nýjan 1,6 km langan veg frá mislægum vegamótum við Reykjanesbraut og austur fyrir Fífuhvammsveg. Framkvæmdir hófust í september 2015, verklok voru áætluð 1. október 2016 en seinkaði af ýmsum ástæðum. Á vegkaflanum voru gerð þrenn gatnamót og tvenn undirgöng. Einnig var sett upp veglýsing, stígar gerðir, land mótað, hljóðvarnir settar upp og annað sem nauðsynlegt er til að ljúka verkinu.

Þrátt fyrir að nú sé umferð hleypt á veginn og hann tekinn í notkun er ýmsum frágangi ólokið en verður væntanlega að mestu lokið 10. desember. Hafin er smíði göngubrúar yfir Arnarnesveg með gerð undirstaða á móts við Þorrasali og kirkjugarð og verður þeirri framkvæmd lokið um mitt næsta ár.

Verkefnið er samstarfsverkefni Vegagerðarinnar, Kópavogs, Garðabæjar og veitufyrirtækja. Heildarkostnaður er áætlaður um 980 m.kr.

Í þingsályktunartillögu að samgönguáætlun 2015-2026 sem lögð hefur verið fyrir Alþingi en er óafgreidd, er gert ráð fyrir því að tengja Arnarnesveg við Breiðholtsbraut á síðasta tímabili áætlunarinnar 2023-2026 og létta þar með á umferðinni í efri byggðum Kópavogs.

Útboðsvefur.is - Opinber útboð

Vegagerðin auglýsir útboð sín á vefsíðunum *Útboðsvefur.is* og *vegagerdin.is* en ekki í þessu blaði. Verktakar eru minntir á að fylgjast vel með auglýsingum.

Framkvæmdafréttir Vegagerðarinnar 11. tbl. 24. árg. nr. 668 22. nóv. 2016

Ritstjórn og umsjón útgáfu: **Viktor Arnar Ingólfsson**
Ábyrgðarmaður: **G. Pétur Matthíasson**
Prentun: **Oddi**

Ósk um áskrift sendist til:
Vegagerðin
Framkvæmdafréttir
Borgartúni 7
105 Reykjavík
eða með tölvupósti til:
askrift@vegagerdin.is

Vegagerðin gefur út Framkvæmdafréttir til að kynna útboðsframkvæmdir fyrir verktökum. Listi yfir fyrirhuguð útboð er birtur, greint er frá niðurstöðum útboða og einnig samningum. Auk þess er í blaðinu annað það fréttaefni sem verður til hjá stofnuninni og talið er að eigi erindi til verktaka og annarra lesenda. Blaðið kemur út einu sinni í mánuði að jafnaði. Áskrifendur eru m.a. verktakar, verkfræðistofur, fjölmiðlar og áhugafólk. Áskrift er endurgjaldslaus.

Skoðanakönnun Maskínu um Vegagerðina og vegakerfið, sumar 2016

Í sumarkönnun Maskínu fyrir Vegagerðina um þjóðvegi landsins kemur í ljós að heldur fleiri eru jákvæðir í garð Vegagerðarinnar en í síðustu könnun og eru nú svipað margir og árin þar á undan. Eins og undanfarin ár er það heimasíða Vegagerðarinnar og símaþjónusta sem skora hæst hjá þeim sem spurðir voru. Símaþjónustan dalar þó aðeins frá síðustu könnun en þá hækkaði hún talsvert.

Viðhald og ástand vega fær hins vegar laka einkunn en leiða má líkum að því að minna viðhald og erfiður vetur þar sem vegir komu illa undan vetri skýri þetta að einhverju leyti.

Undan því verður þó heldur ekki litið að viðhald hefur ekki verið með þeim hætti sem Vegagerðin vildi vegna minni fjárveitinga undanfarin ár.

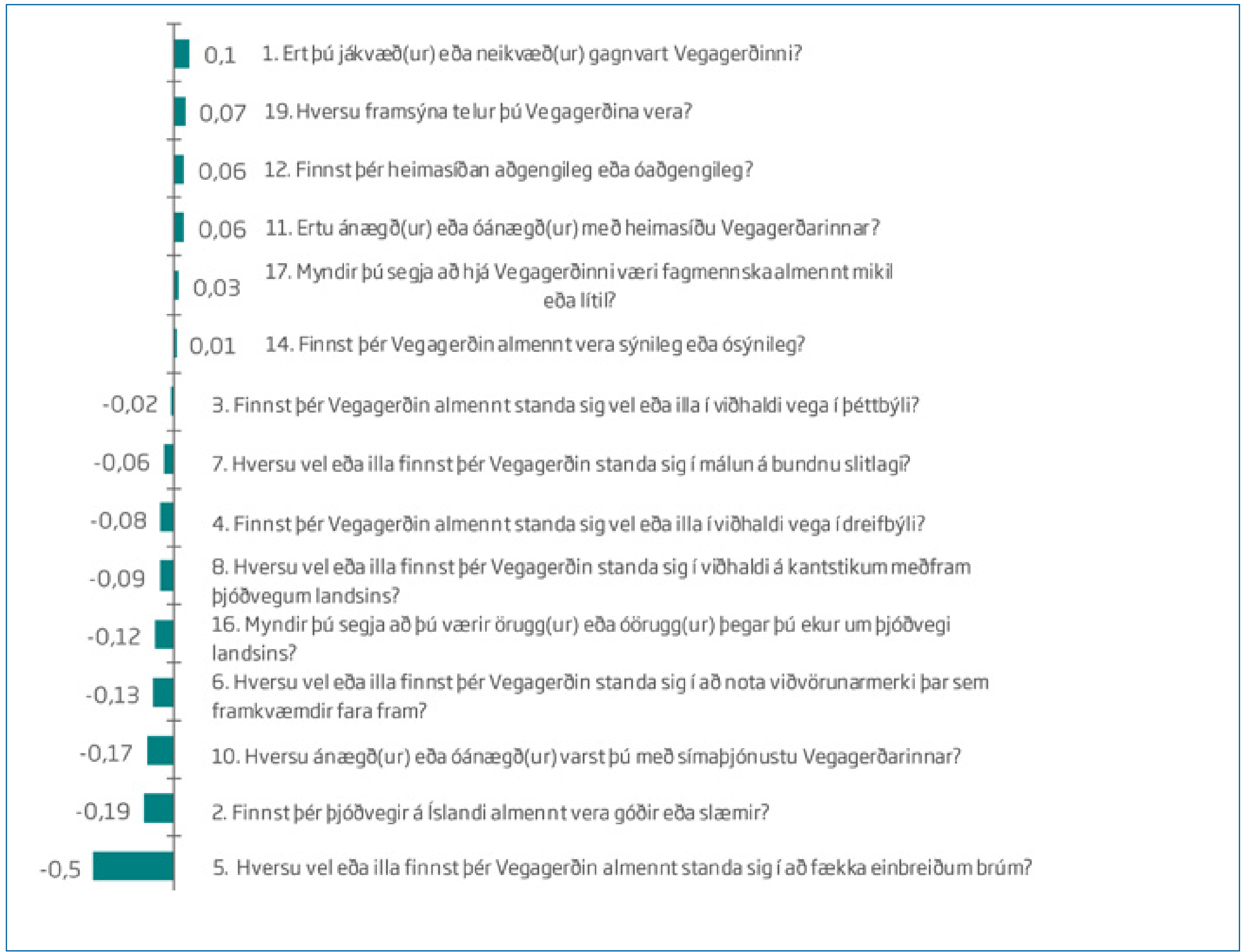
Enn fækkar þeim sem finnst að þjóðvegir séu góðir á Íslandi og einnig fækkar þeim nú sem telja að Vegagerðin standi sig vel í viðhaldi vega í dreifbýli.

Sé litið til könnunarinnar sem gerð var sl. vetur fækkar þeim sem telja sig örugga á vegunum, sýnileiki Vegagerðarinnar batnar og fleirum finnst fagmennska mikil hjá Vegagerðinni Skýrsluna í heild má finna á vegagerdin.is. ■

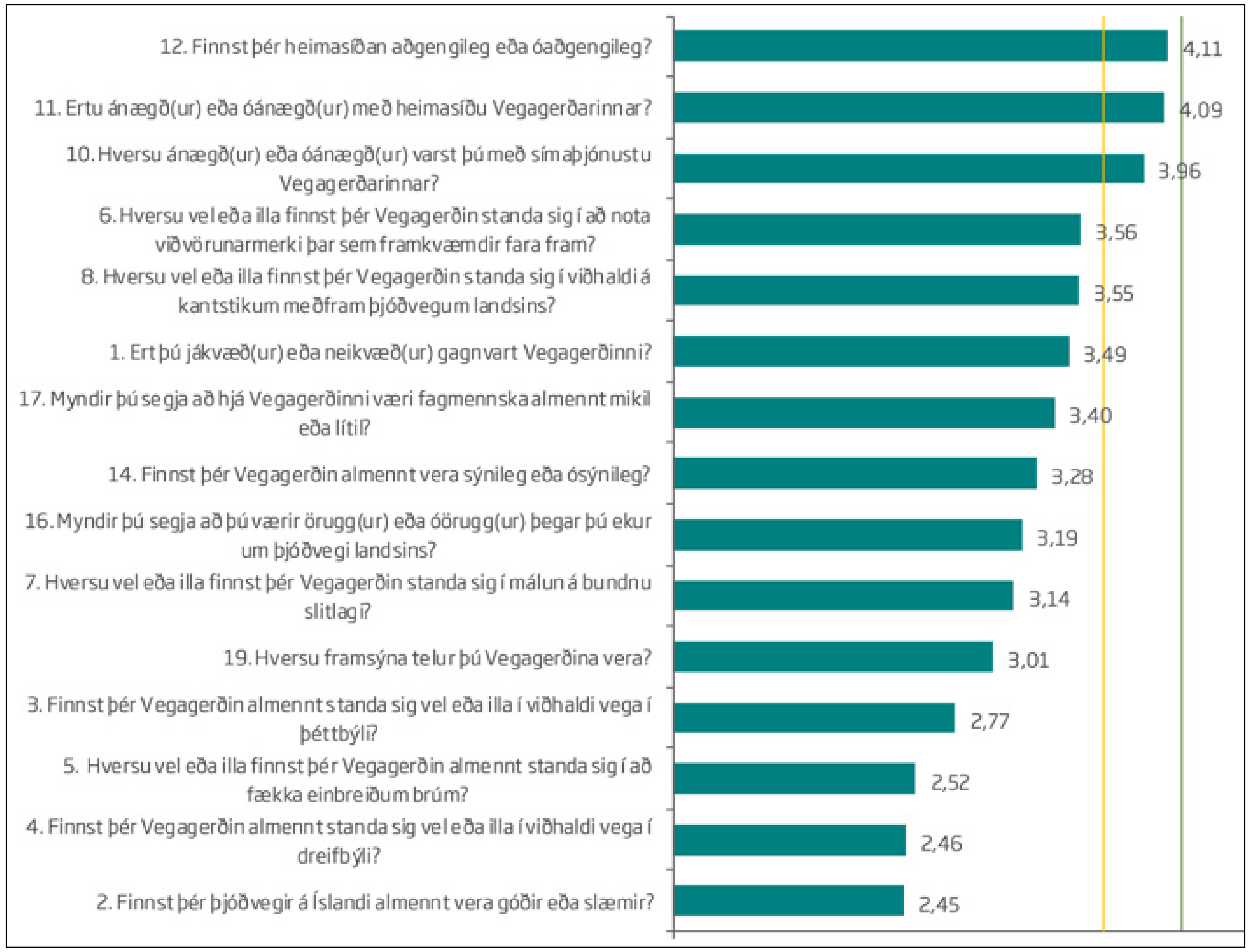
Skýring á litum lóðlínanna:

Hægra megin við **græna lóðlínu:** Styrkleikabil (4,20-5,00).
Milli **gulu** og **grænu lóðlínu:** Tækifæri til nokkurra úrbóta (3,70-4,19).
Vinstra megn við **gula lóðlínu:** Tækifæri til mikilla úrbóta (1,00-3,69).

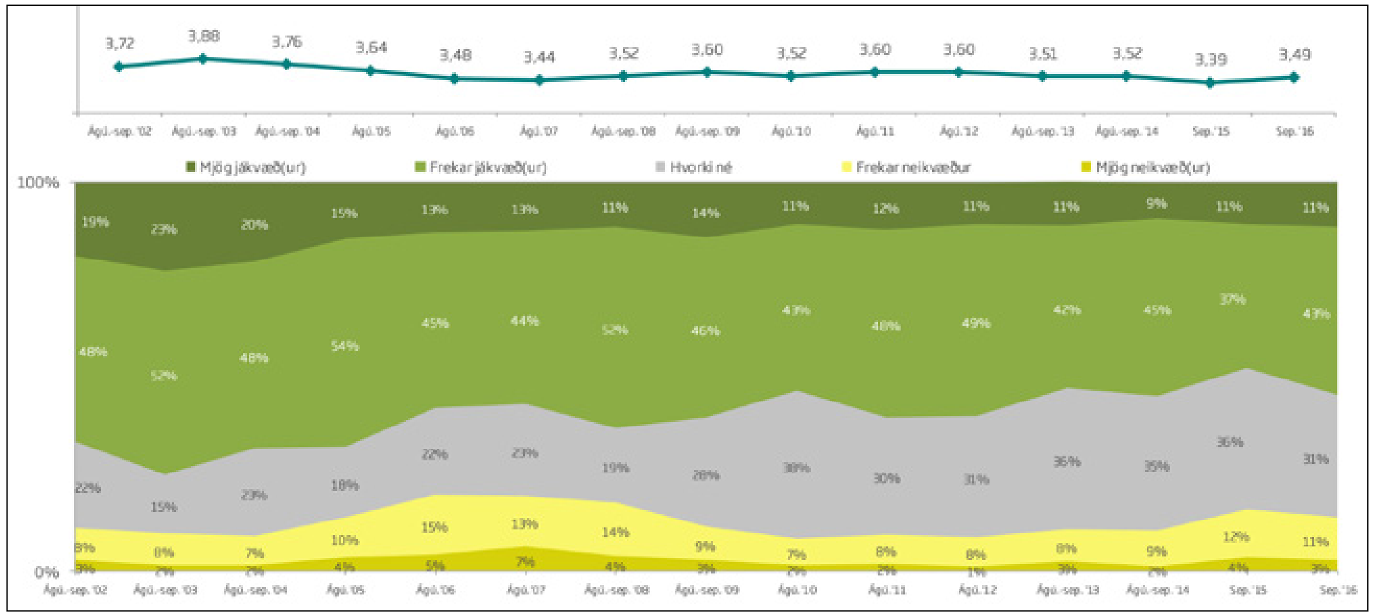
Skýringar á litum lóðlínanna á myndinni á síðunni hér til hægri sem sýnir helstu niðurstöður könnunarinnar.



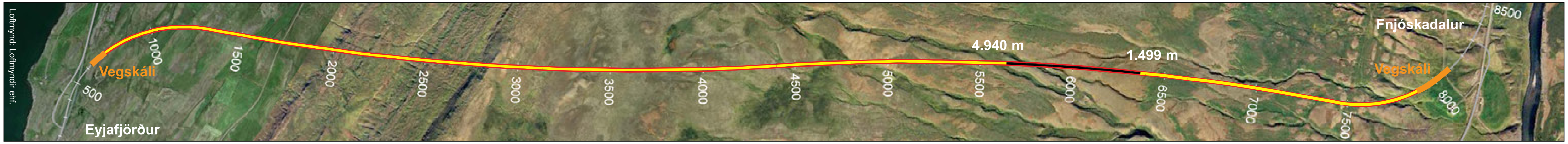
Breytingar á meðaltölum allra spurninga sem eru á fimm stiga kvarða, breytingar frá síðustu sumarkönnun, september 2015.



Helstu niðurstöður könnunarinnar á fimm stiga kvarða sýna hvar eru sóknarfæri hjá Vegagerðinni til að bæta ímynd sína hjá almenningi.



Spurningin „Ertu jákvæður eða neikvæður gagnvart Vegagerðinni?“ Þróun svara frá árinu 2002.



Vaðlaheiðargöng, staða framkvæmda 14. nóvember 2016. Búið er að sprengja samtals 6.439 m sem er 89,4% af heildarlengd.

Heildarlengd ganga í bergi 7.206 m, vegskálar ekki meðtaldir. Sjá: www.vadlaheidi.is

Hringvegur (1) um Blönduós, viðgerð á brú yfir Blöndu

Nú í haust hefur brúavinnuflokkur Vegagerðarinnar frá Hvammstanga unnið að viðgerð á brúnni yfir Blöndu þar sem Hringvegurinn (1) liggur um Blönduós. Brúin var byggð 1962 og 1963, sú fyrsta hér á landi sem var gerð úr eftirspenntri steinsteypu. Heildarbreidd brúar er 9,63 m. Akbrautin var mjókkuð nokkuð árið 1991 þegar gangbraut með handriði var sett á vinstra kant, á leið norður (undan straumi). Líklega var hugmyndin að minnka umferðarhraða í gegnum þéttbýlið. Nú hins vegar þykir akbrautin full mjó fyrir stærstu bíla til að mætast á og því var ráðist í talsverðar endurbætur um leið og slitgólfið var endurnýjað, gera nýja brík hægra megin (á móti straumi), með vegriði í samræmi við kröfur í dag, og mynda þakhalla á akbraut en yfirborðið var áður nánast með engum hliðarhalla. Eftir framkvæmdina verður „slettuvarin" gangbraut á vinstri kanti eins og áður en upphækkuð ræma á hægri kanti hefur verið fjarlægð.

Vinna þurfti verkið á einni akrein í einu með umferð á hinni akreininni. Sett voru upp umferðarljós til að stjórna umferð um eina akgrein á meðan verkið stendur yfir.

Steypan sem er notuð í brúargólfið er slitsterk, veðrunarþolin og rýrnunarlítil hástyrkleikasteypa. Hún hefur verið í þróun hjá Nýsköpunarmiðstöð Íslands í samvinnu við Vegagerðina.

Bygging Blöndubrúar 1962. Fyrir í brúarstæðinu var gömul stálgrindarbrú. Því var hægri akrein nýju brúarinnar byggð fyrst. Síðan var umferð hleypt á þann brúarhluta en gamla brúin fjarlægð (og flutt á Svartá). Að því loknu var vinstri akrein nýju brúarinnar byggð.

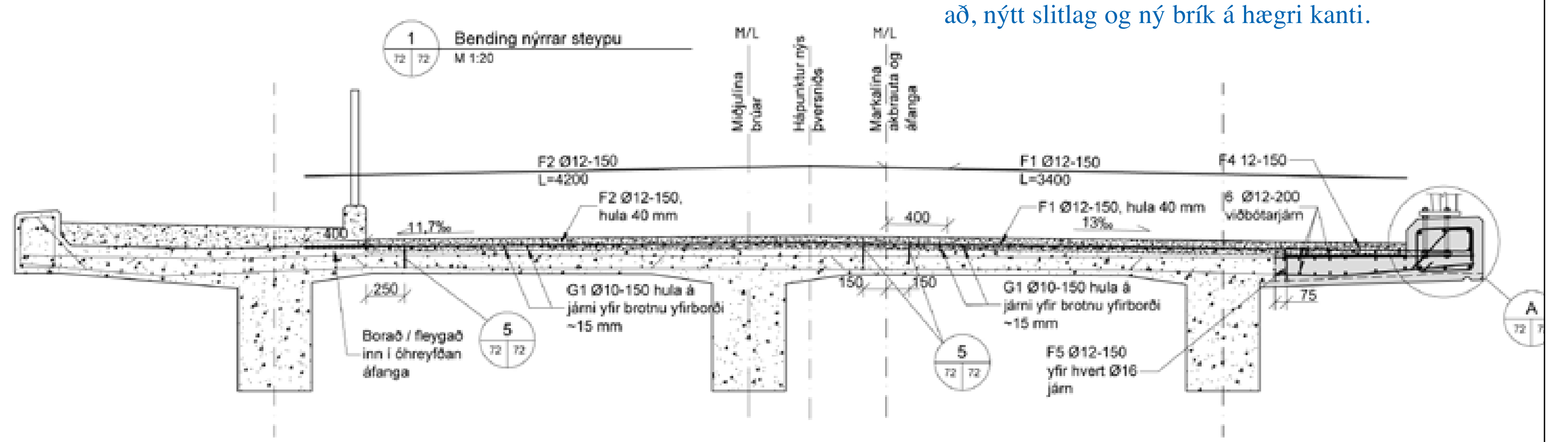
Reynt er að vanda steypublönduna sérstaklega með réttu magni og kornakúrfu steinefna, sements, stál- og plasttrefja, mismunandi íblöndunarefna og vatns. Engin steypustöð er á Blönduósi en sú næsta er á Sauðárkróki. Það þótti því tilvalið að prófa að blanda steypuna beint í steypubíl á staðnum, svokölluð trukkasteypa. Það er hluti tilraunaverkefnis til að skoða hvort mögulegt sé að framleiða hágæða steypu með þeirri aðferð þegar langt er til steypustöðva sem eru þannig búnar að þær geti annast það. Tilraunin gekk m.a. út á að skoða hvernig mætti standa að blönduninni, þannig að hraðinn væri nægur m.t.t. niðurlagnarinnar. Tveir steypubílar voru notaðir í verkið.

Þessi steypa er hálfsjálfútleggjandi, hana þarf ekki að titra til að hún leggist rétt. Hún er án loftblendis og frostþolin vegna lágs vatns/sements hlutfalls (< 0,3). Steypan er talin bindast mjög vel við undirlag. Endurbætur á Borgarfjarðarbrú sem

Ástand Blöndubrúar áður en viðgerðarvinna hófst.

Ljósastýring umferðar á meðan aðeins er opin ein akrein á Blöndubrú.

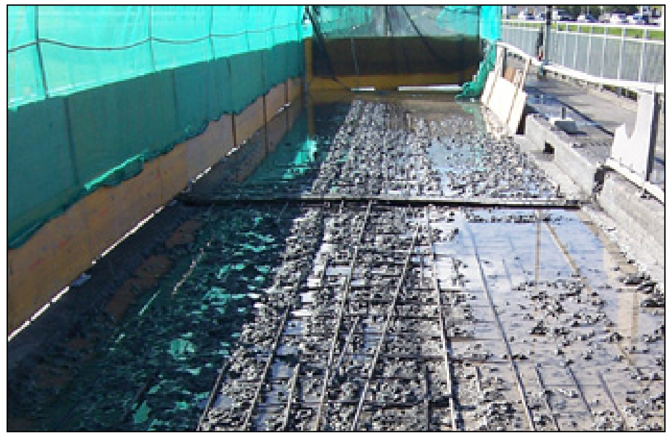
Þversnið Blöndubrúar.
Skyggðu svæðin sýna þá hluta sem nú er unnað að, nýtt slitlag og ný brík á hægri kanti.



hafa verið unnar á undanförnum árum eru gerðar með þessari steypu.

Nú eru í gangi rannsóknir á steypu sem er skyld þessari og nota má sem slitlag á nýjar brýr og í viðgerðir á brúm sem geta tekið við auknum þunga án vatnsbrots yfirborðs.

Á Blöndu var efsta lag gömlu steypunnar í brúardekkinu brotið með vatnsþrýstingi og átti meðalþykkt að vera 40 mm. Raunin varð sú að talsvert þykkara lag var fjarlægt að stórum hluta, sérstaklega yst á hægri akrein en þar komu í ljós talsverðar steypuskemmdir sem náðu jafnvel í gegnum brúargólfið. Viðgerðirnar urðu því mun umfangsmeiri og þurfti að setja upp röð stálbita yfir brúargólfinu til að halda uppi undirslætti fyrir þessar viðgerðir. Að öðrum kosti hefði þurft að slá upp verkpöllum undir brúna sem hefði verið mun meira verk og dýrara. ■



Vinstri akrein eftir vatnsbrot.

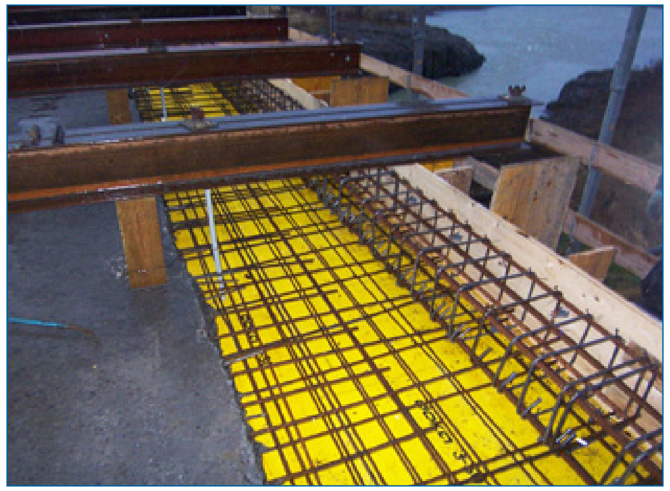
Steypan blönduð í steypubíl á staðnum.

Steypan lögð út á vinstri akrein. Sjá má nýja járnabindingu.

Steypuskemmdir yst í hægri akrein.

Yfirborð nýju steypunnar er mjög slétt.

Stálbitar til að halda uppi undirslætti. Innri endi er festur niður með tveimur teinum sem eru límdir niður í brúargólfið.



Undirsláttur fyrir útkrögun og nýja brík á hægri kanti Blöndubrúar.

Vík í Mýrdal, sandfangari sem var byggður 2011, sjá niðurstöðu útboðs hér á síðunni.

Niðurstöður útboða

Vík í Mýrdal – Sandfangari 2016 16-075

Tilboð opnuð 1. nóvember 2016. Bygging á um 200 m löngum sandfangara við Vík í Mýrdal auk lagfæringar á sandfangara sem byggður var árið 2011.
Helstu magntölur:
Heildarmagn af kjarna og flokkuðu grjóti um 45.600 m^3
Nýbyggingu sandfangara skal að fullu lokið 30. september 2017. Verkinu skal að fullu lokið eigi síðar en 31. júlí 2018.

nr.	Bjóðandi	Tilboð (kr.)	Hlutfall (%)	Frávik (þús.kr.)
2	LNS Saga ehf., Kópavogi	724.159.668	276,4	450.621
1	Suðurverk hf., Kópavogi	273.538.180	104,4	0
---	Áætlaður verktakakostnaður	261.956.792	100,0	-11.581

Skagabyggð og Skagaströnd, sjóvarnir 2016 16-082

Tilboð opnuð 15. nóvember 2016. Sjóvarnir við Víkur og Kálfhamarsvík í Skagabyggð og við Réttarholt á Skagaströnd.
Helstu magntölur:
Útlögn grjóts og kjarna um 4.700 m³
Verkinu skal lokið eigi síðar en 15. apríl 2017.

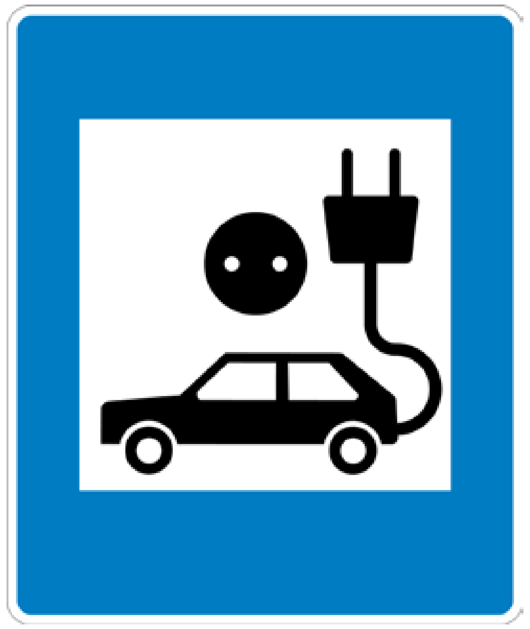
nr.	Bjóðandi	Tilboð (kr.)	Hlutfall (%)	Frávik (þús.kr.)
4	Norðurtak ehf., Sauðárkróki	29.475.600	128,6	5.369
3	Árni Helgason ehf., Ólafsfirði	24.206.200	105,6	99
2	F.J.V. sf., Skagaströnd	24.133.956	105,3	27
1	Vélaþjónustan Messuholti, Sauðárkróki	24.107.000	105,2	0
---	Áætlaður verktakakostnaður	22.913.200	100,0	-1.194

Skagabyggð, sjóvörn við Víkur, sjá niðurstöðu útboðs.

Framkvæmdir við Dettifossveg 3. október 2016.

Þjónustumerki fyrir rafbíla, tillögur Vegagerðarinnar

Rafbílum fjölgar stöðugt á vegum landsins og vaxandi þörf er fyrir aðstöðu þar sem hægt er að koma þeim í hleðslu. Vegagerðin hefur látið teikna upp þjónustumerki sem vísar á slíka staði og mun leggja til við innanríkisráðuneyti að þessi merki verði tekin inn við næstu endurskoðun umferðarmerkjareglugerðar. Táknin eru í stíl við önnur íslensk umferðarmerki en svipuð hugmynd og mörg erlend tákn. Stoppúrið er tákn fyrir hraða. ■



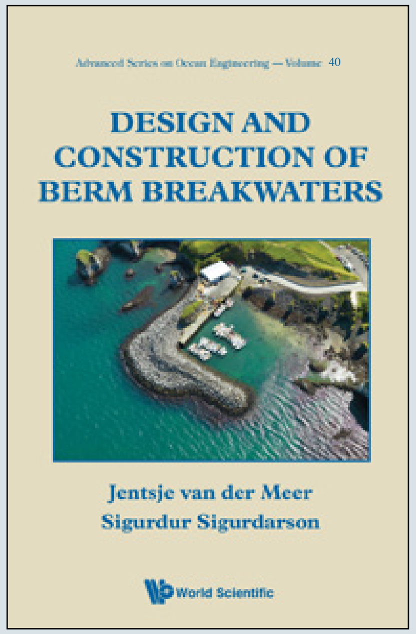
E03.16 Hleðsla fyrir rafbíla
Merki þetta vísar á stað þar sem hægt er að komast í rafmagn til að hlaða rafbíla.

E03.17 Hraðhleðslustöðvar
Merki þetta vísar á hraðhleðslustöð fyrir rafbíla.

Verkfræði bermugarða

Sigurður Sigurðarson verkfræðingur á siglingasviði Vegagerðarinnar hefur í félagi við Jentse van der Meer skrifað bók um hönnun og gerð bermugarða sem er sérstök gerð brimvarnargarða. Þessi aðferð var tekin í notkun á Íslandi og þróuð áfram þannig að nú er til sérstök gerð „Icelandic-type berm breakwater“.

Höfundarnir hafa samtals yfir 40 ára reynslu við að hanna og byggja þessa garða. Bókin, *Design and Construction of Berm Breakwaters*, kom út hjá World Scientific bókaútgáfunni nú í haust og er fáanleg á amazon.com.
Hér er birtur 1. kafli bókarinnar á ensku.



Jentse van der Meer (t.v.) og Sigurður Sigurðarson við brimvarnargarðinn í Helgusvík.

Chapter 1

History of Modern Berm Breakwaters

1.1 Time before modern berm breakwaters

Several nineteenth century breakwaters are usually reported as the origin of berm breakwaters, [Bruun and Johannesson, 1976], [Baird and Hall, 1983]. Many of these were exposed to waves too high in relation to the size of rock available for construction. Steep slopes resulted in severe damage, often repaired by a continuous supply of fairly small rock until an almost stable S-shaped equilibrium profile was reached. Among these are the breakwaters at Cherbourg in France, Plymouth in UK, Madras in India and Port Elliot in Australia.

In the 1960s, Priest *et al*. [1964] described a seaward profile, which is natural to the breakwater materials and the waves to which they are subjected. Experimental studies, often at a single water level, showed a stable, reshaped cross-section of an S-shape resulting in less wave action than on the initial steeper profile. It was concluded that a greater crosssectional area was required for the breakwater forming the natural profile than for the conventional type cross-section. But, considering the possibility of using smaller stones than those indicated by conventional formulae, there might be instances where breakwaters with natural profile will compare favourably, in an economical sense, with those of conventional profiles.

In the late 1970s and early 1980s many researchers and engineers considered the idea of equilibrium slope and the importance of porosity or permeability, [Bruun and Johannesson, 1976], [Bruun, 1985]. The porosity of the armour, under-layers and core is a determining factor in the intensity of out and inflow which affects the stability of the structure. It was noted that the stability of rubble mound structures increases when "maturing". That is, the structure adjusts to wave attack and reaches an equilibrium profile or an S-shape with relatively small stone considering the wave climate. “”

1.2 Developments in Australia, mass-armoured breakwater

Australia played an important role in the development of berm breakwaters with many innovative structures being built in the 1970s and early 1980s. The earlier mentioned breakwater at Port Elliott in South Australia was one of the 19th century breakwaters constructed by dumping quarried rock into the sea and allowing it to take its own natural slope. At Grassy on King Island, Australia, a refinement of the dumped rock breakwater was achieved using available material from a nearby quarry and careful design, [Gourlay, 1996]. Here 95% of the material was less than 2 t and 5% was between 2 and 10 t. A core of quarry run material was pushed out to an offshore island in up to 18 m water depths, allowing waves to form it into a rocky beach before the large rock, 6-10 t, was placed on top of the reshaped profile for stabilisation.

During a cyclonic attack, the Rosslyn Bay breakwater in Queensland, Australia, suffered severe damage. At high tide the breakwater was heavily overtopped causing catastrophic failure. Material was displaced from the crest and deposited on the leeward slope, widening the profile while the crest was lowered by about 4 m. Still the reshaped breakwater showed a capability of protecting the harbour to some extent, [Foster *et al*., 1978]. The breakwater was repaired by using commonly available rock sizes intermixed with modified concrete cubes with a grading that had the highest possible permeability, [Bremner *et al*., 1987]. The construction procedures eliminated or reduced the use of a crane and simplified the construction by end-tipping with a minimum amount of trimming by dozer and backhoe. The design anticipated that natural wave action would reshape the seaward slope to the stable S-shape found in nature.

The experience from the Rosslyn Bay breakwater was used in the design of an offshore breakwater to protect a reclamation adjoining Townsville harbour in Queensland, [Bremner *et al*., 1980], [Gourlay, 1996]. A shore-parallel offshore breakwater was built with crest level above high tide level. It was expected to fail or reshape under extreme wave conditions to form a submerged structure limiting the waves reaching the revetment protecting the reclamation. Extensive model testing showed that the design concept provided a considerable degree of safety against the design conditions being exceeded. Cost savings of the order of 40% were achieved over a conventional design, partly due to relative ease on construction not requiring large cranes.

The design of the Hay Point tug harbour in Queensland used the experience from these structures, [Bremner *et al*., 1987]. Interpretation of preliminary quarry investigations and trial blasts in a nearby quarry assumed a maximum available rock size of 2-3 t. Further investigations, however, showed that it was possible to quarry armourstone of 3-7 t in large quantities. The development of design using these armourstone led to a definition of the mass-armoured breakwater that is designed and built in an initially unstable form, but with sufficient material provided to allow natural forces to modify its shape to a stable profile. Among the advantages of the mass-armoured breakwater is the use of natural rock in its available sizes.

1.3 Developments in Canada, modern berm breakwaters

Bill Baird and Kevin Hall from Canada initiated the design of what could now be called "modern berm breakwaters", [Hall et al., 1983] and [Baird and Hall, 1984]. The idea was simple and effective with respect to design, construction and costs.

According to Baird and Hall [1984]:

> The basic principal involved in this concept is the use of locally available materials. It is established that the greater the thickness of the armour layer, the smaller the stones that are required to provide stable protection against wave action. Therefore, the thickness of the armour layer for a specific breakwater is determined by the gradation of the available armour stones and the incident wave climate. The final cross-section makes allowance for the practical considerations of breakwater construction. New concepts for breakwaters that have resulted from the use of this alternative design procedure are described. Construction of these breakwaters in 1983-84 has demonstrated that significant cost savings are obtained.

In principle, the full quarry yield was divided into two classes: core and armourstone. The armourstone was used to create a homogeneous and permeable berm, including crest, and was constructed just by putting rock into the sea, as seen in Figure 1.1. This created a very steep seaward slope, often close to the angle of repose. The rock class was fairly small compared to a conventional stable structure and the first storms would partly reshape the berm into a more stable S-profile. Designs storms would give more reshaping until a large part or the whole berm was eroded and a stable S-profile was established. The easy quarrying (only two rock classes), easy construction and use of fairly small rock instead of large rock, or even concrete units, led to substantial cost savings.

By 1984, two berm breakwaters had already been constructed in Canada: Codroy in Newfoundland and North Bay in Ontario. The Helguvik breakwater in Iceland had also been designed by Baird & Associates, but was constructed a little later. Figure 1.2 shows the Helguvik breakwater more than twenty years after construction. Although the intention was to have a reshaping berm breakwater, the berm has hardly been reshaped during this period as quite some safety was used in the detailed design, mainly through the establishment of design wave height.

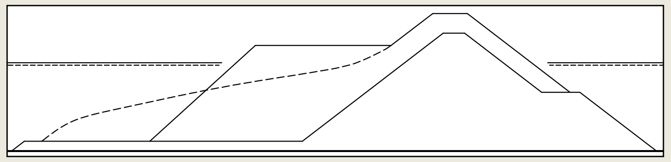


Figure 1.1. Principal sketch of first design of modern berm breakwaters in 1984.

Figure 1.2. Berm breakwater of Helguvik, Iceland. Designed in 1983 by Baird & Associates and constructed in 1986-1988 by Icelandic contractors.

1.4 Contact between Canada and the Netherlands

The paper Baird and Hall [1984] was presented at the International Conference on Coastal Engineering in Houston. It was at the same conference where the first paper on new stability formulae of Van der Meer [Van der Meer and Pilarczyk, 1984], was presented, using the stability number $H_s/\Delta D_{n50}$ (Hs = significant wave height, Δ = relative mass density and D_{n50} = nominal diameter, see also Chapter 2). At that time, the research of Van der Meer was still in progress, with a focus for 1984 and 1985 on dynamically stable structures, like gravel or shingle and rock beaches.

The idea was to describe profile formation for dynamically stable structures, which indeed became possible (Van der Meer [1988-a]). There is a direct link to reshaping berm breakwaters, being the connection between full dynamically stable structures and statically stable conventional structures.

A week after the conference in Houston, Baird and Van der Meer met each other in Ottawa, discussing the berm breakwater concept and dynamic stability with profile formation. It led to restructuring of Van der Meer's research on rock slopes and gravel beaches, including some tests with berm profiles (Figure 1.3).

The focus of the research, however, was from gravel beaches towards reshaping berm breakwaters, not from static stability to more dynamic stability. Most of the berm profiles had stability numbers of $H_s/\Delta D_{n50}$ = 3.8-6.0, still far from statically stable reshaped berm breakwaters, where the stability number should not be larger than $H_s/\Delta D_{n50}$ = 3.0. Dynamically stable structures, like rock and gravel beaches, could well be ▸

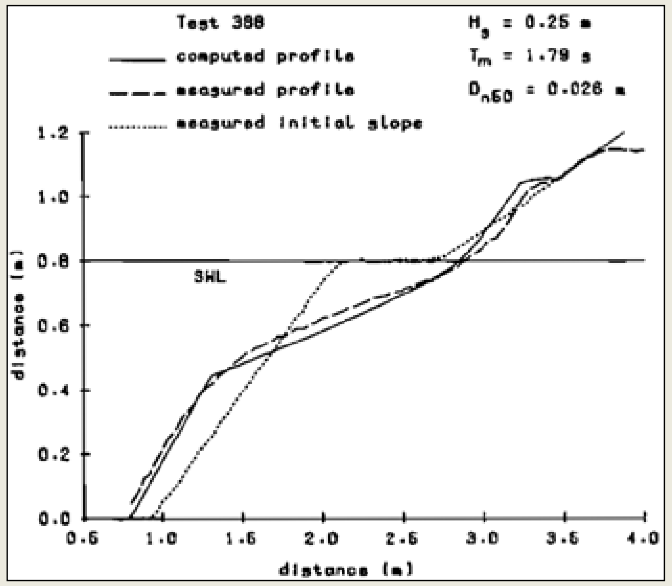


Figure 1.3. Berm-type profile in research on dynamic stability of [Van der Meer, 1988-a]. Test 388, including calculated profile by Breakwat; $H_s/\Delta D_{n50} = 5.9$.

described by the parameter H_oT_{om}, where T_{om} is a dimensionless mean wave period (see Chapter 2). Using this parameter means that a longer wave period will give a longer S-profile. It is this parameter H_oT_{om}, which still plays a role in description of the behaviour of dynamically stable structures, but less in berm breakwaters as the influence of the wave period is much smaller for berm breakwaters.

1.5 Developments in Iceland

During the preparation phase and model testing of the Helguvik breakwater in 1982 to 1983, undertaken by National

Figure 1.4. Overtopping during a storm at the pier of Hofsós before construction of the berm breakwater.

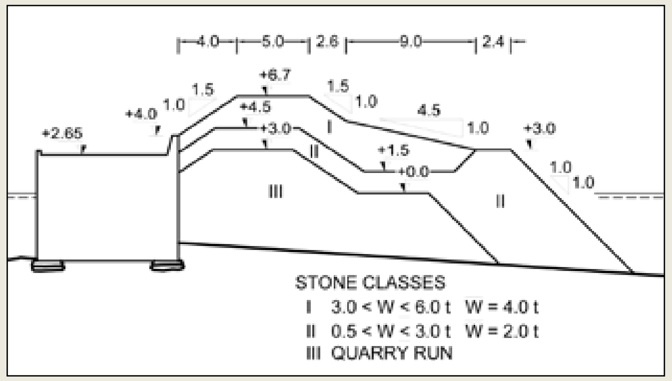


Figure 1.5. Cross-section of the design of the Hofsós berm breakwater from 1983 on the seaside of an existing pier for overtopping prevention.

Figure 1.6. The Hofsós breakwater in 2015 which was constructed in 1983. Photo Indridi Einarsson.

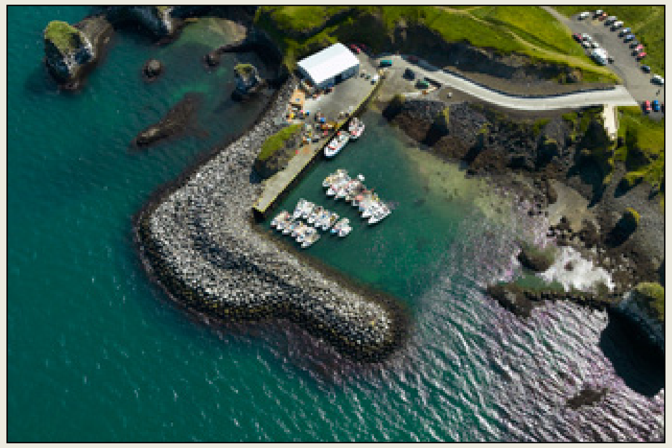


Figure 1.7. The berm breakwater at Arnarstapi, Iceland, sheltering a small fishing harbour. Photo Mats Wibe Lund.

Research Council (NRC) in Ottawa, the Icelandic Harbour Authority came to know about the berm breakwater design procedure. It was recognised that this design was very well suited for Icelandic conditions. At this time, the general opinion among engineers, geologists and contractors, was that it was difficult to quarry large armourstone from the Icelandic basalt. Several breakwater projects had been delayed due to the relatively large design wave height and lack of large armourstone for a conventional rubble mound design.

In 1983, two berm breakwater projects were initiated — a new breakwater at Bakkafjördur (see Section 9.5.2) and an overtopping protection of an existing pier at Hofsós. The existing pier at Hofsós showed too large and frequent overtopping (see Figure 1.4).

The cross-section of the design is shown in Figure 1.5. Crest and upper slope use Class I rock, 3-6 t and $H_s/\Delta D_{n50} = 2.2$, with a narrow front berm and lower slope of Class II rock,

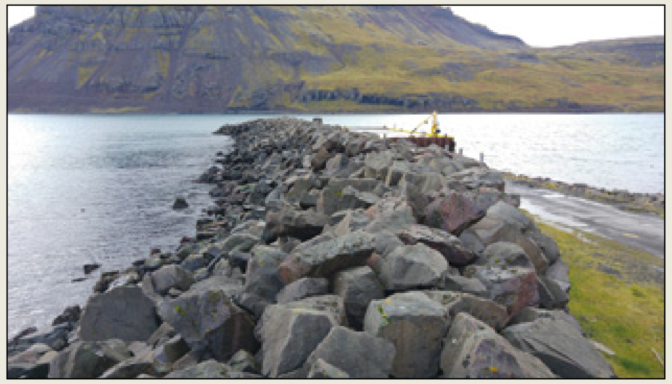


Figure 1.8. The berm breakwater at Nordurfjördur, Iceland, 30 years after construction (1984-1985). Photo R. Kamsma.

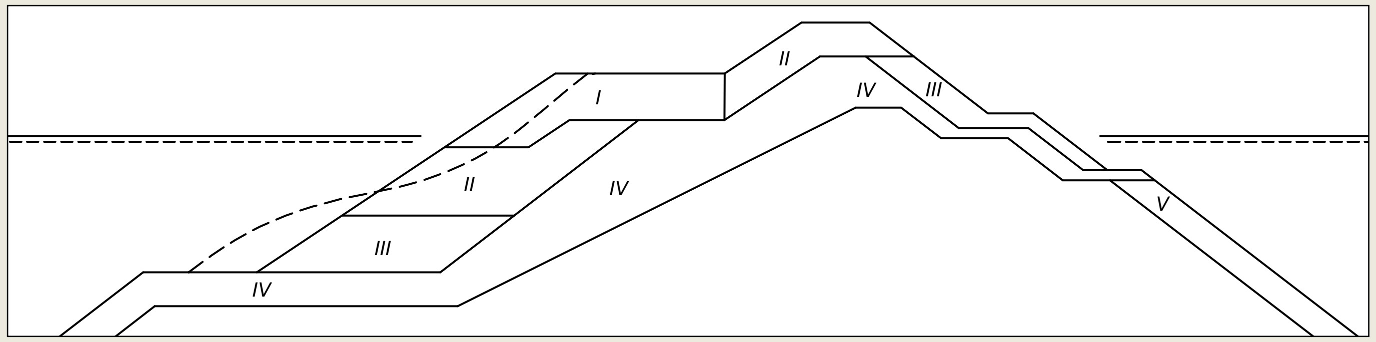


Figure 1.9. Principle cross-section of an Icelandic-type berm breakwater.

0.5-3 t and $H_s/\Delta D_{n50} = 3.0$. The breakwater at Hofsós was constructed in 1983 and since then, the berm has eroded, but the upper slope remains (see Figure 1.6).

The year after, in 1984, three more projects were initiated. At Arnarstapi an extension of an existing breakwater protecting a small fishing harbour was constructed. The berm structure at Arnarstapi was constructed from 1984-1985 and was rebuilt and extended by 45 m of conventional rubble mound in 2002 (see Figure 1.7). Another new berm breakwater was constructed at Nordurfjördur (see Figure 1.8). With a stability number of $H_s/\Delta D_{n50} = 2.4$ on the trunk of the berm at Nordurfjördur, the berm has fully reshaped, while on the roundhead the berm holds its shape due to larger armourstone.

A third and small berm type structure was constructed at Thorlákshöfn, preventing overtopping at the root of an existing breakwater.

During the subsequent years, several berm structures were constructed every year. In 1990, twelve berm breakwaters had been constructed, in 1995 - seventeen and in 2000 twenty-seven berm breakwaters had been constructed in Iceland, 50% of the known berm breakwaters worldwide, [Sigurdarson *et al*., 2000]. All of these projects were designed and managed by a relatively small group at the Icelandic Harbour Authority, which in 1996 became the Icelandic Maritime Administration and from 2013 is a part of the Icelandic Road and Coastal Administration.

In contrast to the reshaping approach presented by Baird and Hall, the Icelandic approach gradually developed into a design of a statically stable berm breakwater where only minor reshaping was acceptable. The reason was mainly due to the rock quality, as it was recognised that abrasion of the basaltic rock in Iceland could be high. To strengthen the berm, the size of armourstone in the two uppermost layers was increased to compensate for potential loss of weight, [Viggosson, 1990]. More stone classes were used compared to the original two stone class structure presented by Baird and Hall. While the stability number, $H_s/\Delta D_{n50}$, for the bulk of the rock berm was usually higher than 3.0, the stability number for the two uppermost layers was chosen as $1.2 < H_s/\Delta D_{n50} < 2.5$, so that only minor or limited reshaping was accepted under design wave conditions for the statically stable berm. These breakwaters showed less reshaping than the structures built with the original concept given by Baird and Hall [1984]. With less reshaping, it became possible to use smaller stones inside the berm, in areas that would not become directly exposed to the wave forces.

In the early phase of the development of the berm breakwater in Iceland, 3D physical model tests at scales of 1:45 and 1:60 were often used to test and refine the design. Both from testing and from some of the early berm projects, it became clear that the statically stable berm was excellent in reducing wave overtopping. During the eighties and nineties several concrete piers, which frequently experienced wave overtopping, were protected with a berm structure. Due to the high permeability, the berm practically swallowed up the incoming wave. Another feature recognised was the low reflection from these structures and especially from the breakwater roundheads. This increased the safety of vessels sailing through narrow harbour entrances and navigating in the vicinity of the berm structures.

Over the years, the design of the berm breakwaters developed in Iceland. The first structures were designed with a steep seaward slope as the reshaping berm breakwaters, with a natural angle of repose, often with the slope as steep as 1:1. This gradually changed to more gentle slopes, first to 1:1.3 and later to a much more stable slope of 1:1.5. The elevation of the berm did also develop from a low berm on the first structures to a higher berm. One of the initial reasons for this was that the excavators needed a working level for placing the top two layers on the berm of larger rock. The final result was a much less reshaping berm breakwater with more classes and large rock at the most attacked zone: the Icelandic-type berm breakwater (see Figure 1.9). It may be concluded that the Icelandic-type berm breakwater is significantly more engineered in contrast to the original berm or mass-armoured berm breakwaters and it includes more rock classes.

Construction methods were also taken into account and developed in cooperation with contractors through the projects. The experience from the first projects in Iceland was that using bulldozers to push rocks onto the berm generated too many fines that plug voids and diminish the berm permeability and wave energy dissipation. In later construction, armour placement was mainly performed by excavators of various sizes, which were able to place armourstone without the contamination of finer material. For short reach the excavators stood on the core but for longer reach, they were able to crawl on the smaller stone classes.

One of the basic ideas behind the berm breakwater concept was the utilisation of all size grades from the armourstone quarry. In Iceland all breakwater projects were executed with a dedicated quarry. The size of the large armourstone to be used for protection of the berm depended on the availability of large rock from the quarry. Therefore, a special emphasis was put on quarry investigations and quarry yield prediction was introduced as an integrated part of the Icelandic design procedure. At the same time, the blasting design developed to improve the yield of large armourstone. Lessons learned from one project were brought to the next by the project team and gradually it became possible to quarry large armourstone from the Icelandic basalt, but most often with a limited yield.

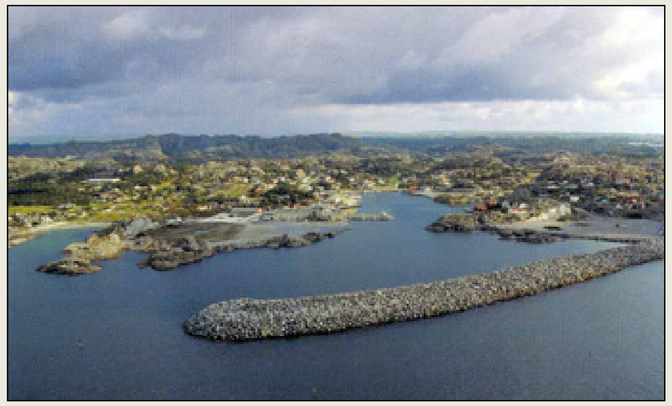


Figure 1.10. Icelandic-type berm breakwater at Sirevåg, Norway, with 20-30 t class rock. Courtesy of the Norwegian Coastal Administration.

In the late nineties and early twenties, the concept of a statically stable berm design, based on utilisation of a dedicated local armourstone quarry and taking into account practical construction methods, came to be known as the Icelandic-type berm breakwater.

At the same time, several projects with a design wave height of about H_s = 7 to 7.5 m, were undertaken. This was a challenging task and demanded quarrying for armourstone heavier than 15 or 20 t. One of these breakwaters is the Sirevåg breakwater in Norway (see Figure 1.10). With a design wave height of H_s = 7.0 m and the largest stone Class I of 20-30 t, all quarried armourstone down to 1 t were utilised as well as all quarry run for the core of the breakwater.

1.6 Berm breakwaters in international cooperation

The Workshop on berm breakwaters in Ottawa in 1987 [Berm breakwaters, 1987] was the first occasion in which berm breakwater knowledge was gathered. Later, European research work between 1990 and 1998 [MAST I, 1993] and [MAST II, 1997], gave more insight in various aspects of berm breakwaters and validated the idea that using available large rock on the right locations improved stability as well as it gave less reshaping.

A state of the art report on berm breakwaters was produced by PIANC MarCom Working Group 40 [PIANC, 2003], summarizing the research done so far and giving practical guidance for design and construction. This WG40-report also gave a classification of nonreshaping, partly reshaping and fully reshaping berm breakwaters, which describes the behaviour of different types of berm breakwaters. WG40 was not, however, able to derive accurate prediction formulae for recession of berm breakwaters.

More results of research on berm breakwaters became available after PIANC [2003]. This research has led to better understanding of the types of berm breakwaters present (mass-armoured with a homogeneous berm and Icelandic-type) and with a more precise classification (nonreshaping, partly reshaping and fully reshaping). Design guidance has been developed, using the existing formulae of Van der Meer [1988-a] for description of damage and an updated and more precise formula for recession of the berm.

1.7 Outline of the book

The first part of this book, Chapters 2–4, gives the more scientific background of berm breakwaters, including classification and development of design formulae for berm reshaping and wave overtopping. Chapter 5 mainly describes guidelines for the geometrical design of the cross-section. Chapters 6 and 7 give practical guidance on quarrying, project operation and construction. Chapter 8 uses all the information from the previous chapters to give direct design guidance for the different types and classes of berm breakwaters and for a design wave climate with wave heights between 3 m and 7 m. Finally, some examples of constructed berm breakwaters are described in Chapter 9. ■

15. rannsóknaráðstefna Vegagerðarinnar 28. október

Allar glærur, ágrip og myndir má finna á vefnum

http://www.vegagerdin.is/upplysingar-og-utgafa/frettir/ahugaverd-rannsoknaradstefna

Þórir Ingason forstöðumaður rannsókna Vegagerðarinnar setur ráðstefnuna.

Ásbjörn Ólafsson, Jóhann B. Skúlason og Helgi Kjartansson.

Guðmundur Sigurðsson, Hreinn Haraldsson, Einar Hafliðason og Jónas Snæbjörnsson.

Kristín A. Matthíasdóttir, Viktor Steinarsson og Svala Þyri Garðarsdóttir.

Niðurstöður útboða

Ríkiskaup 2042

Áætlunarflug á Íslandi með sérleyfi fyrir Vegagerðina

Tilboð opnuð 14. nóvember 2016. Ríkiskaup, fyrir hönd Vegagerðarinnar, óskaði eftir tilboðum í rekstur á flugleiðunum. Leitað er aðilum til að annast áætlunarflug með farþega og vörur til og frá Gjögri, Bíldudal, Grímsey, Vopnafirði, Þórshöfn og Höfn í Hornafirði, samkvæmt nánari skilgreiningu sem finna má í útboðsgögnum.
Tilboðsupphæðir miðast við fjárhæð styrkja í þrjú ár.

nr.	Flugleið	Bjóðendur: Flugfélagið Ernir ehf.	Norlandair ehf.	Kostnaðaráætlun
1	Reykjavík - Gjögur - Reykjavík	102.630.906 kr.	-	96.000.000. kr.
2	Reykjavík - Bíldudalur - Reykjavík	311.249.895 kr.	-	276.000.000 kr.
3	Akureyri - Grímsey - Akureyri	-	92.508.579 kr.	69.000.000 kr.
4	Akureyri - Vopnafjörður - Þórshöfn - Akureyri	-	282.389.053 kr.	222.000.000 kr.
5	Reykjavík - Höfn - Reykjavík	289.316.771 kr.	-	237.000.000 kr.

Bíldudalsflugvöllur í Arnarfirði.

Steypuvinna við Morsá 16. október. Skeiðarárbrú sést til vinstri og Lómagnúpur er í baksýn.

Morsá í Skaftafellssýslu, steypa yfirbyggingar

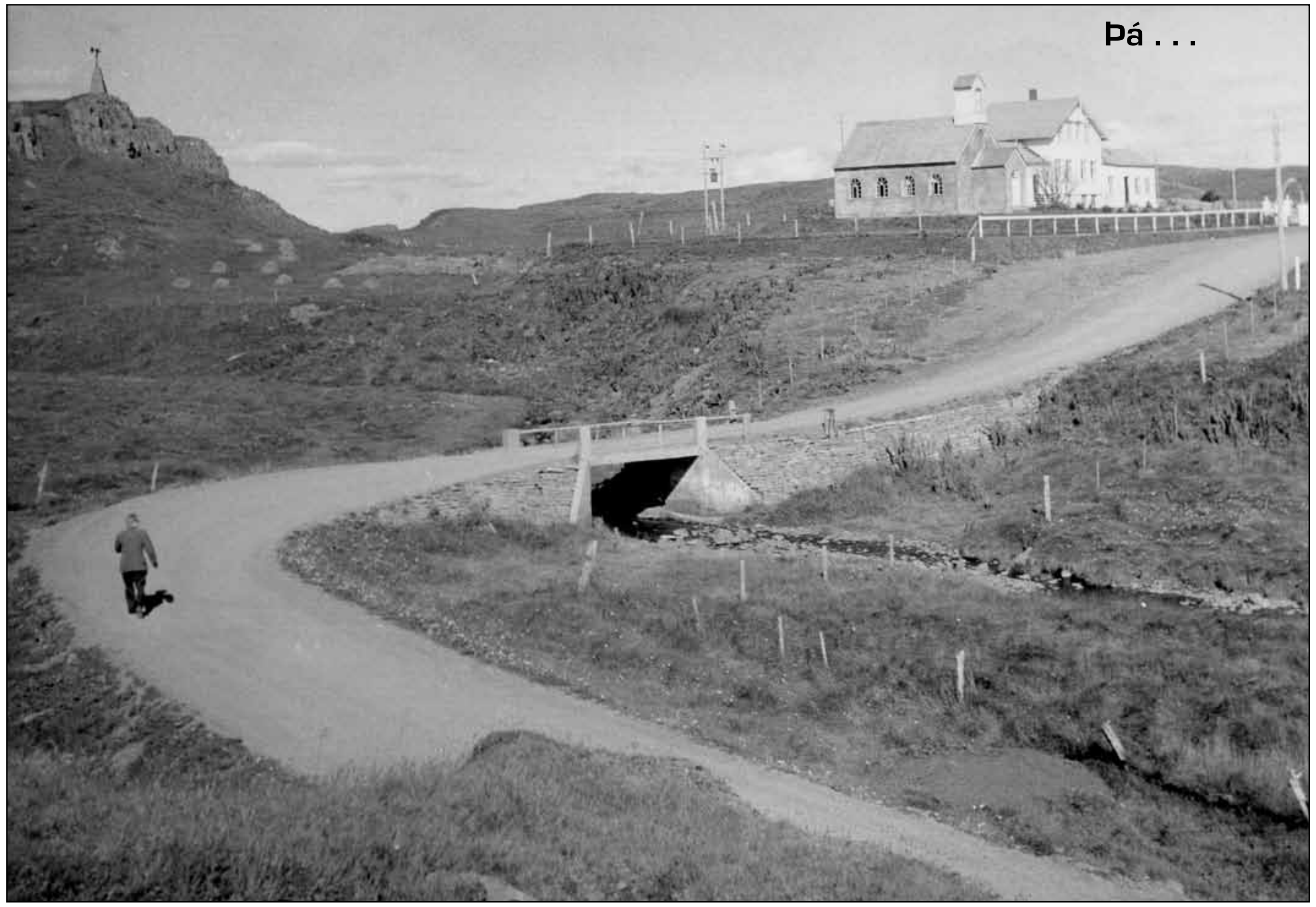
Yfirbygging nýrrar brúar yfir Morsá á Skeiðarársandi hjá Skaftafelli var steypt helgina 15.-16. október. Verkið þurfti að vinna um helgi því vegna anna hjá steypustöðvum á Selfossi og í Reykjavík fengust ekki lánaðir steypubílar í verkið nema yfir helgi. Magn steypu í yfirbyggingu var alls 560 m^3.

Steypan var framleidd í Steypustöðinni í Vík í Mýrdal, sem er staðsett um 136 km frá verkstað. Það er 272 km hringur fyrir steypubílana. Framleiðslugeta stöðvarinnar er u.þ.b. 25 m^3 á klst. Alls voru notaðir 18 steypubílar og 2 steypudælur. Hver steypubíll var um 4 klst. með hringinn (akstur til og frá verkstað + afhending).

Í brúavinnuflokknum frá Vík starfa nú 7 manns auk ráðskonu. Auk þess voru við verkið 5 aukamenn, sumarstrákar og starfsmenn þjónustustöðvar. Einnig 4 múrarar. Alls 16 manns.

Útlögn var skipt í tvo áfanga og notaður seinkari til að koma í veg fyrir steypuskil. Í fyrri áfanga voru ca. 44 m af yfirbyggingu steyptir, eða um 364 m^3 og restin 24 m eftir hvíld hjá starfsmönnum. Fyrsti steypubíll var kominn á verkstað ca. kl. 8:00 á laugardagsmorgni og síðasti um kl. 22:00 um kvöldið. Þá var tekið hlé í útlögn í ca. 11 klst. Hafist handa aftur kl. 8:00 á sunnudegi og síðasti bíll kom kl. 18:00.

Nýja brúin yfir Morsá mun koma í staðinn fyrir núverandi brú yfir Skeiðará. ■



Borg á Mýrum, við Snæfellsnesveg rétt norðan við Borgarnes. Eldri myndin var tekin 1957 þegar þjóðvegurinn fór um hlaðið á kirkjustaðnum. Þá var hann kallaður Stykkishólmsvegur. Yngri myndir var tekin sumarið 2016. Sjónarhornið er líklega heldur meira til vinstri miðað við gömlu myndina, sjá hólinn fremst á báðum myndunum.

Yfirlit yfir útboðsverk

Þessi listi er stöðugt til endurskoðunar og geta dagsetningar og annað breyst fyrirvaralaust.
Það eru auglýsingar útboða á Útboðsvefur.is sem gefa endanlegar upplýsingar.
Fremst í lista er númer útboðs í númerakerfi framkvæmdadeildar.
Rautt númer = nýtt á lista

Fyrirhuguð útboð	Auglýst: dagur, mánuður, ár
16-079 Kísilvegur (87), Kollóttaalda - Geitafellsá	2016
16-088 Langavatnsvegur (553), Hringvegur - Þjónustuhús Iðju	2016
16-081 Reykjanesbraut (41), sunnan Hafnarfjarðar, vegamót við Krýsuvíkurveg	2016
16-087 Uxahryggjavegur (52), Borgarfjarðarbraut - Gröf	2016
16-080 Arnarnesvegur (411), göngubrú	2016
16-023 Langholtsvegur (341)	2016
16-027 Hringvegur (1) um Berufjarðarbotn	2016
16-022 Endurbætur á Þingvallavegi (36)	2016
15-056 Álftanes, sjóvörn 2015	2016
15-053 Harðviður 2015	2016
15-050 Landeyjahöfn, dælulögn og dæla,	2016
13-067 Sjóvarnir Vestmannaeyjar 2013	2016

Auglýst útboð	Auglýst:	Opnað:
16-090 Grindavík, endurbygging Miðgarðs	14.11.16	29.11.16
16-089 Heinsun þjóðvega á Suðursvæði 2017-2018	14.11.16	29.11.16
16-084 Endurbætur á Biskupstungnabraut, (35), Geysir - Tungufljót	07.11.16	22.11.16
16-078 Yfirlagnir Suðursvæði og Austursvæði 2017-2018, blettanir með klæðingu	07.11.16	29.11.16
16-077 Yfirlagnir á Vestursvæði og Norðursvæði 2017-2018, blettanir með klæðingu	31.10.16	22.11.16
16-040 Dýrafjarðargöng, forval	09.05.16	28.06.16

Útboð á samningaborði	Auglýst:	Opnað:
16-082 Skagabyggð og Skagaströnd, sjóvarnir 2016	31.10.16	15.11.16
16-075 Vík í Mýrdal, sandfangari 2016	10.10.16	01.11.16
16-072 Fáskrúðsfjörður Strandarbryggja	12.09.16	20.09.16
16-065 Vetrarþjónusta 2016-2019, Reykhólasveit	22.08.16	13.09.16
16-058 Stofnvegakerfi höfuðborgarsvæðisins, umferðargreining 2016	02.08.16	06.09.16
16-068 Norðfjörður Netagerðarbryggja, stálþil	22.08.16	13.09.16
16-051 Eskifjörður, styrking grjótvarna	06.06.16	21.06.16
15-085 Norðfjarðargöng: Stjórnkerfi	09.05.16	07.06.16

Samningum lokið	Opnað:	Samið:
16-057 Vetrarþjónusta 2016-2021 uppsveitir Árnessýslu *Þjótandi ehf., kt. 500901-2410*	16.08.16	14.09.16
16-056 Vetrarþjónusta 2016-2021 vegir á svæði Selfoss – Reykjavík *IJ Landstak ehf., kt. 710713-0490*	16.08.16	30.09.16
16-071 Skarðsstöð, dýpkun og grjótvörn *Urð og grjót ehf., kt. 580199-2169*	03.10.16	21.10.16
16-070 Patreksfjörður, styrking grjótvarnar við Oddann 2016 *Allt í járnum ehf., kt. 561098-3369*	20.09.16	13.10.16
16-069 Borgarfjörður eystri, endurbygging brimvarnar við Hafnarhólma *Héraðsverk ehf. kt. 680388-1489*	13.09.16	05.10.16
16-073 Djúpvegur (61) Súðavíkurhlíð, hrunvarnir *Tígur ehf. kt. 620402-3970*	20.09.16	07.10.16
16-069 Siglufjörður raflagnir í Bæjarbryggju *Tengill ehf. kt. 690987-1559*	03.08.16	23.09.16

Viðgerð á Blöndubrú, sjá bls. 4-5.