

EXECUTIVE SUMMARY for commARCH (Commercial Architecture Research Group's Survey of Architects and Owner/Developer Perceptions regarding Vegetative Green Roofs

Global warming or climate change has led to many environmental issues, including higher atmospheric temperatures, intensive precipitation, and increased greenhouse gas emissions resulting in increased indoor discomfort conditions. Thus, growing demand for mechanical ventilation, leading to higher energy consumption in buildings. Researchers worldwide have collectively agreed that one way of reducing the impact of global warming is by implementing "Vegetative Roof Technology", which integrates vegetation growing mediums and waterproofing membranes on top of the roof surface.

Environmental Advantages of Vegetative Green Roofs include:

- Roofs represent a large percentage of impervious surfaces; placing vegetation on them can substantially reduce stormwater runoff.
- Vegetative roofs can manage much or all of the runoff that a building's roof area would otherwise cause.
- Vegetative roofs cover standard roofing materials, shielding them from wear and prolonging their life.
- Rooftop vegetation adds to the insulation of a building, reducing cooling and heating requirements.
- The collective effect of several buildings with Vegetative roofs can reduce the "heat island" effect of urban areas, improve the air quality, and reduce dust and other airborne particles.

VEGETATIVE GREEN ROOF

Architect and Owner/Developer Perception Study

June 2021

Underwritten by Owens Corning Vegetative Roof Assemblies (VRA) and its product FOAMULAR NGX



Source: The Wharf, Washington, DC

In light of this, beginning in late-May through early June 2021, **commARCH Research Group** reached out to Architects and Owner/Developer subscribers to study the more expansive perception of vegetative roofs and their role in upcoming commercial buildings. While much of the research demonstrated the commercial construction community embracing vegetative roofs, architects, and their clients, owners/developers, have different levels of interest. Reviewing the findings, areas were identified that showed a higher value for owners/developers than architects and vice versa.

This research and its insights intend to positively promote the discussion of vegetative green roofs and their usage moving forward.

Who took part in the study?

A survey was sent to a random selection of 500 people within commARCH's subscriber database generating a 32% response rate. Of those 161 participants, the highest response came from subscribers who identified mainly as architects. A percentage of these architects additionally classified their role as an owner/developer. The subsequent highest participation came from owners/developers, a small percentage of which aligned with the architect role.

While general contractors, builders, specialty contractors, installers, and engineers also participated, the main focus of this presentation is on the first two groups, their agreements and their differing perspectives.

Conclusions

Vegetative green roofs are of high interest and considered in many cases as problem-solvers and property value enhancers.

The missing elements to driving higher-volume usage include the need for criteria and resources to identify experienced, knowledgeable architects, contractors and consultants to provide a credible understanding of long-term maintenance requirements.

There is a significant need for more information for vegetative roofs to become more common amongst the commercial construction landscape. Credible information can be provided by building product suppliers, associations, research organizations and business media.

While there is industry-wide agreement as to the importance of using experienced contractors and innovative irrigation requirements, 77.1% of subscribers identify maintenance considerations a vital point of discussion in the implementation of vegetative roof designs. Both Architects and Owner/Developers agree on this subject, and it is clear why.

The added maintenance cost is significant and should be a point of concern; however, research has shown that the cost of installing a vegetative roof is mainly made up for by its increased longevity. Over a 50-year period, despite building and

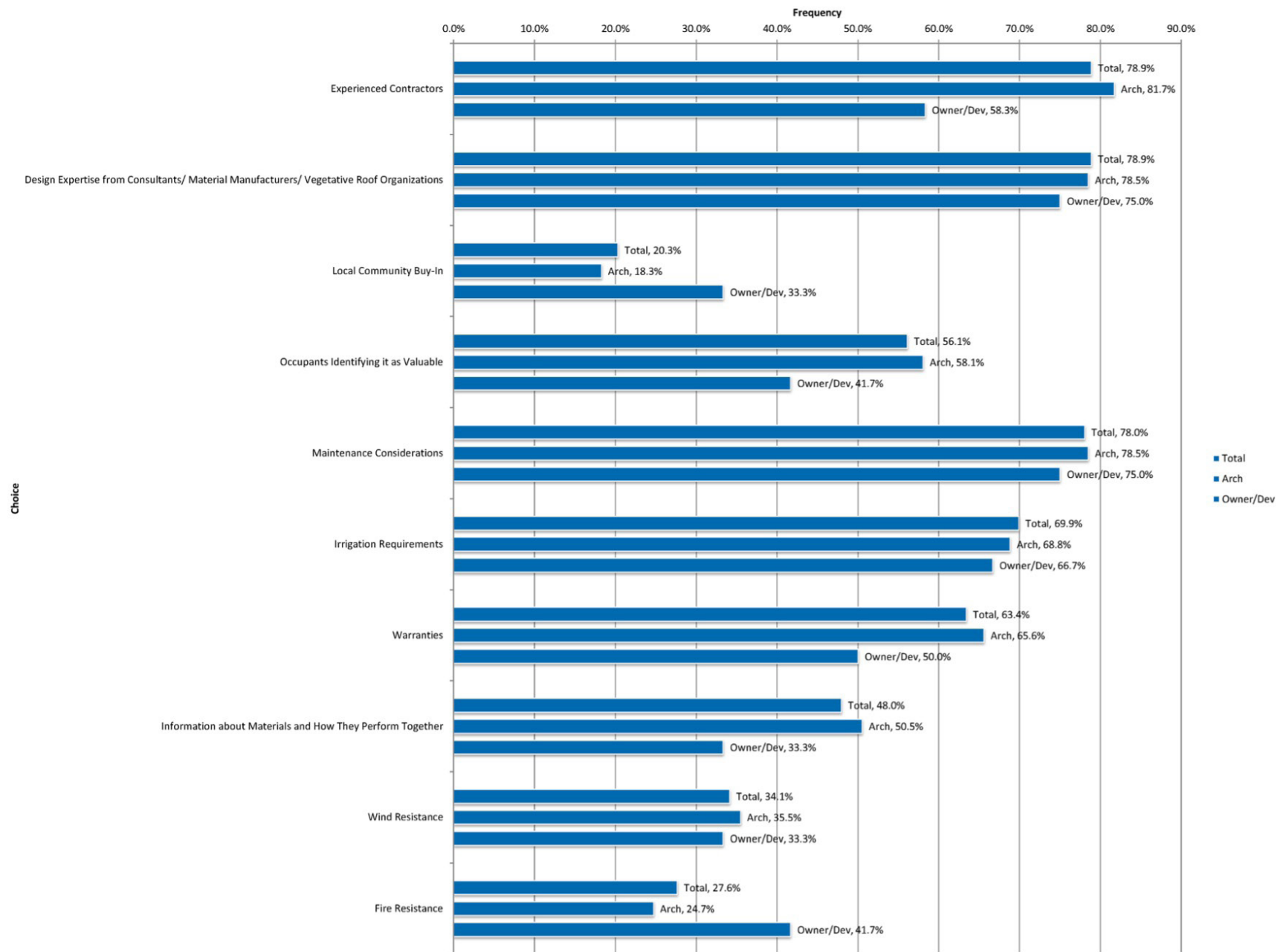
site characteristics, stormwater regulations and varying energy costs, long-term savings of green roofs more than make up for the increased premium of installation and maintenance.

In addition to this, the specific real estate effect of green roofs, or their impact on real estate economics from a market and financial perspective, yields varying benefits that can affect a building's net operating income and market valuation.

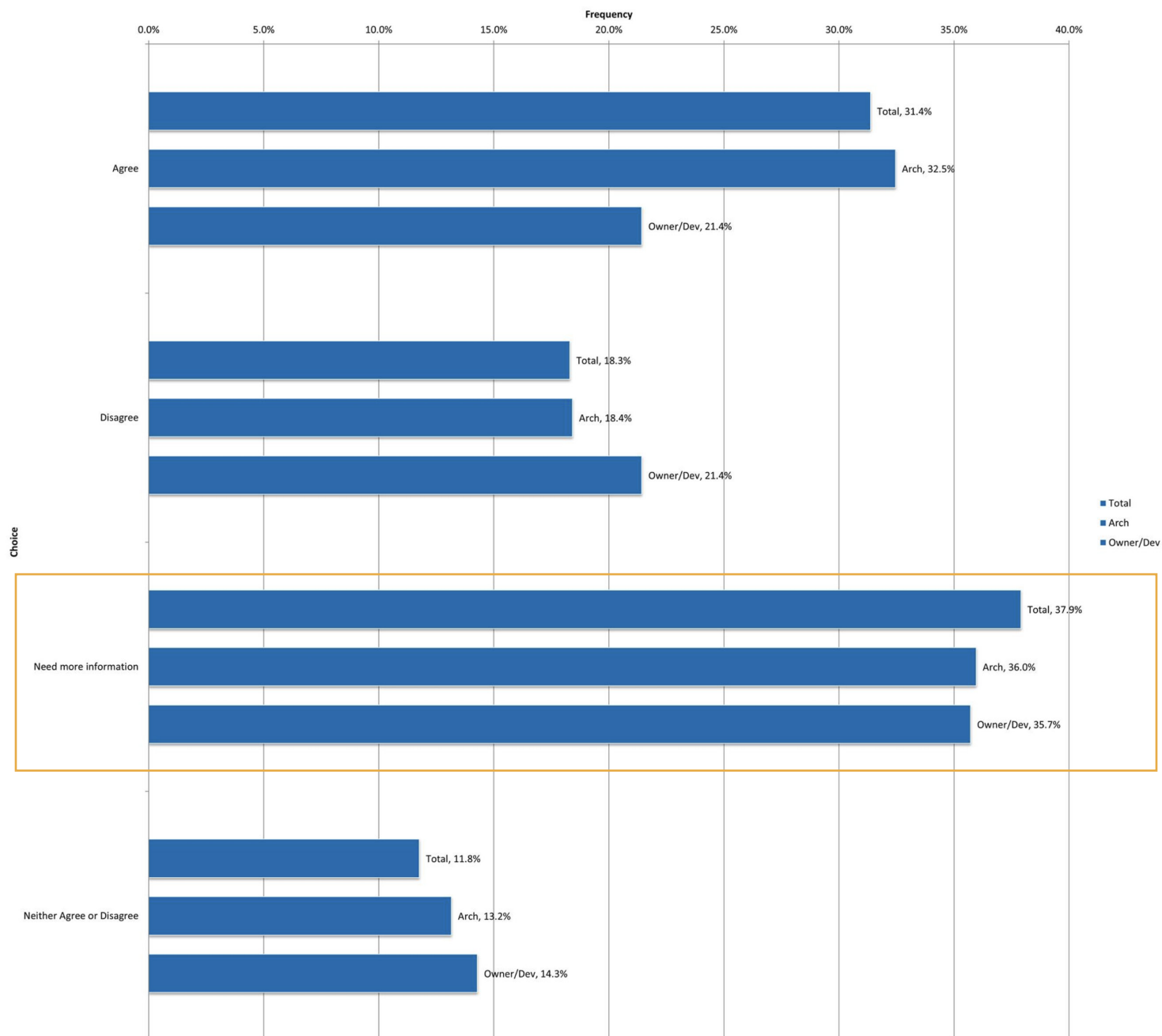


Source: Dickies Arena, Texas

- Which of the following are **ESSENTIAL CONSIDERATIONS** when including a vegetative green roof in a building design?
- Vegetative green roofs **REDUCE OPERATIONAL COST** of a building, agree or disagree?
- Vegetative green roofs can **INCREASE THE VALUE** of a building?
- Which of the following do you consider vegetative green roofs as a **PROBLEM SOLVER** for?
- How important is **BUILDING-TYPE** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“EXTENDED ROOF LONGEVITY”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“PV SOLAR PANEL EFFICIENCY IMPROVEMENTS”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“ADDED PROPERTY VALUE”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“ADDED USABLE SPACE”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“REDUCED COOLING COSTS”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“STORM WATER RUNOFF”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“REDUCTION IN POLLUTANTS”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“HABITAT CREATION”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“HEALTH & WELLNESS”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“NOISE REDUCTION”** when deciding to incorporate a vegetative green roof in a new or existing building?
- How important is **“GEOGRAPHIC LOCATION”** when deciding to incorporate a vegetative green roof in a new or existing building?
- Which of the following **BUILDINGS** would you consider a vegetative green roof to be applicable?
- What would you consider **ADVANTAGES** of vegetative green roofs for a building you may plan to build over the next 2 years?
- What would you consider potential **DISADVANTAGES** of vegetative green roofs for a building you may plan to build over the next 2 years?
- What **GEOGRAPHIC** areas of the United States would you recommend vegetative green roofs for a building?

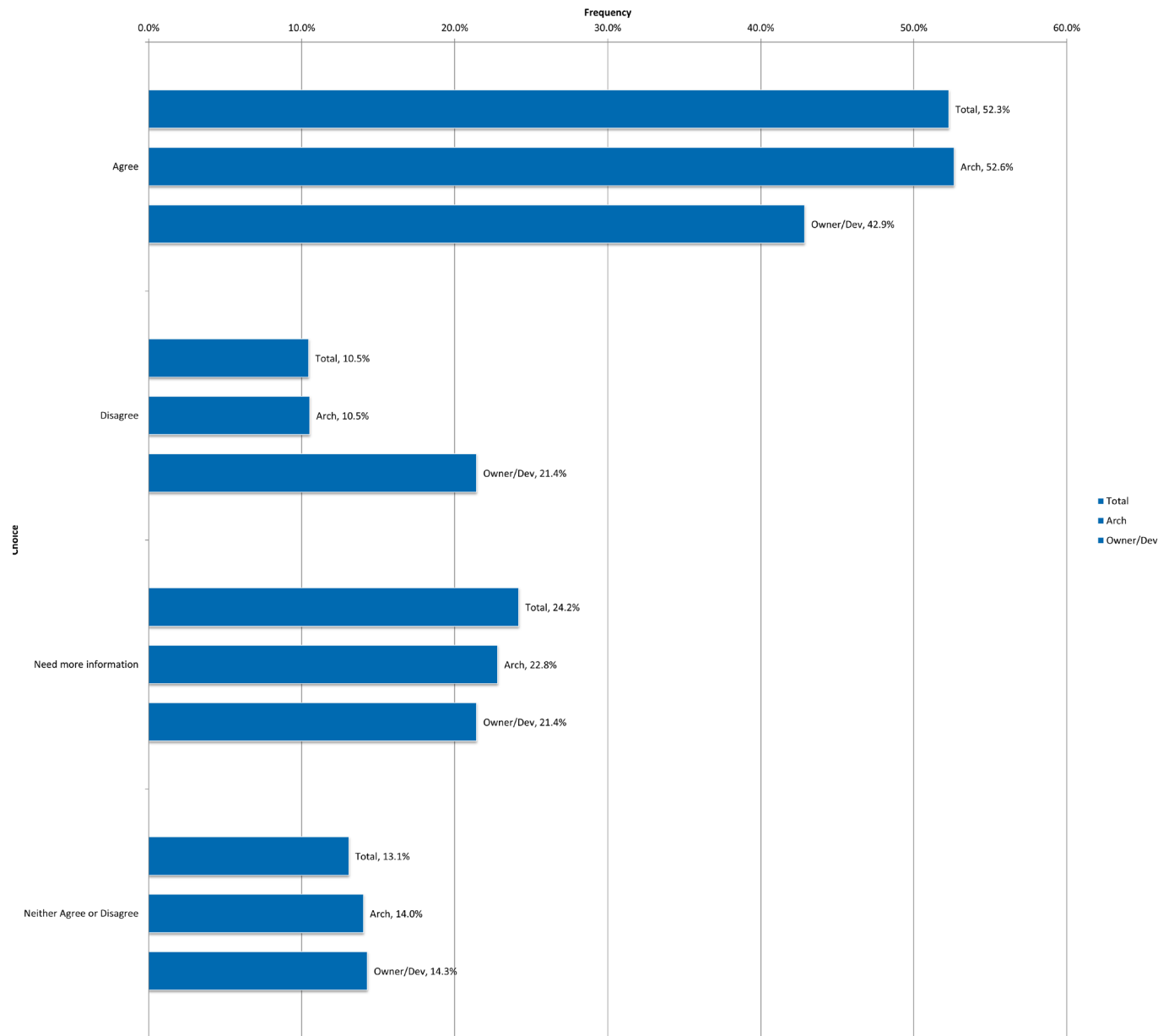
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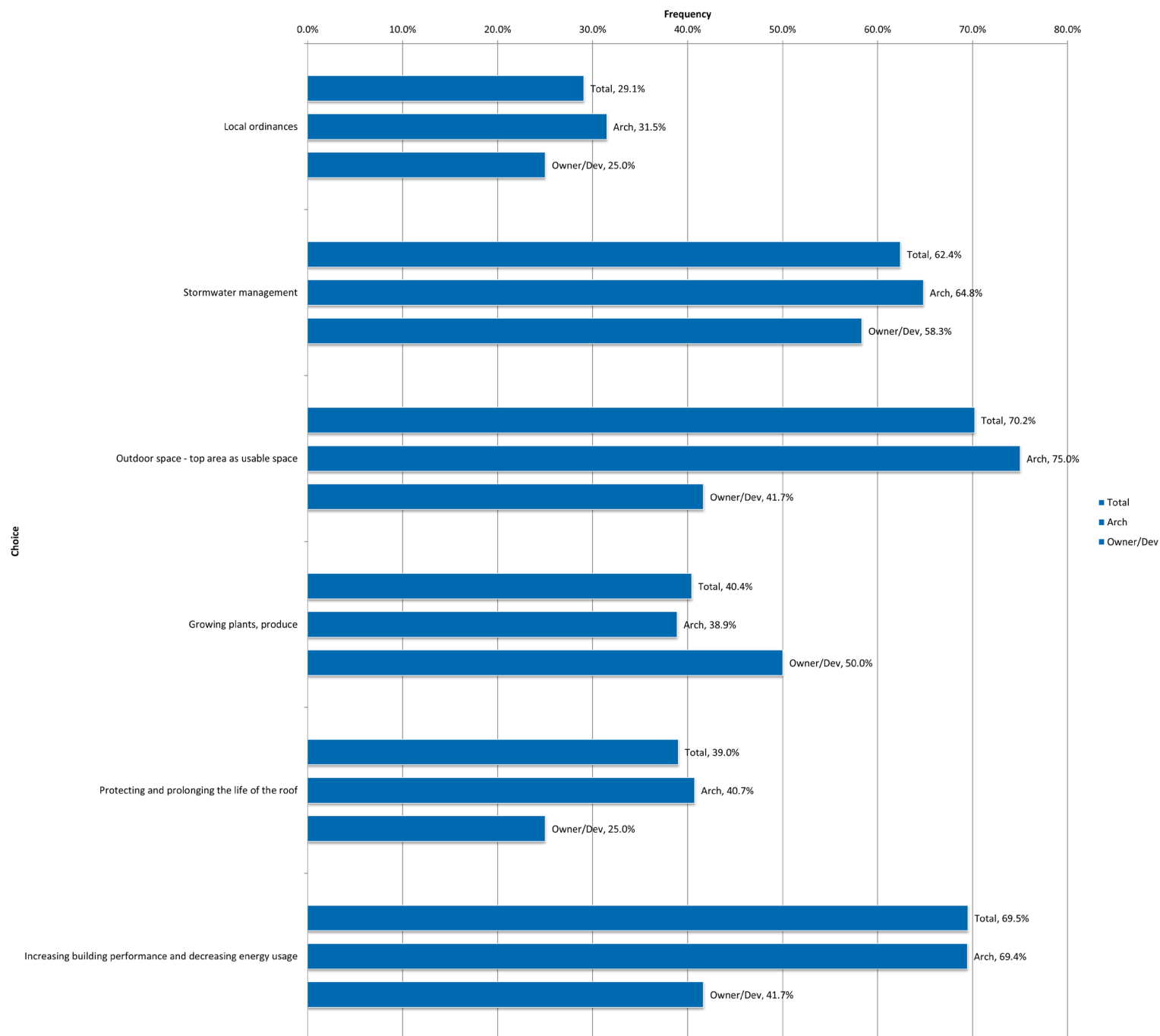
Vegetative green roofs REDUCE OPERATIONAL COSTS of a building, agree or disagree?



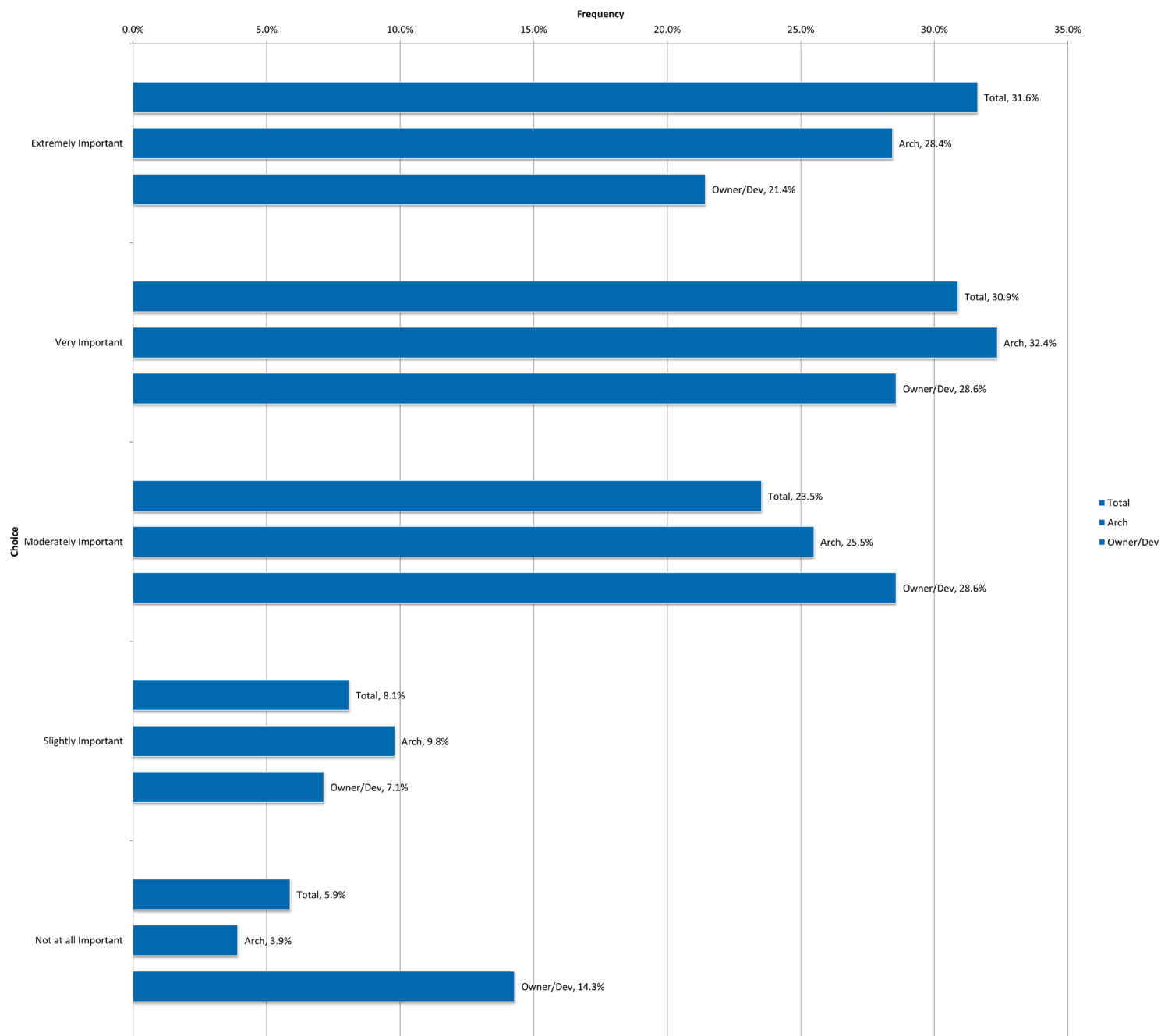
While the findings show a large percentage in agreement with this statement, participants identifying with "Need more information" and "Neither Agree or Disagree" demonstrates an information gap needing to be actively addressed.

Vegetative green roofs can INCREASE THE VALUE of a building?

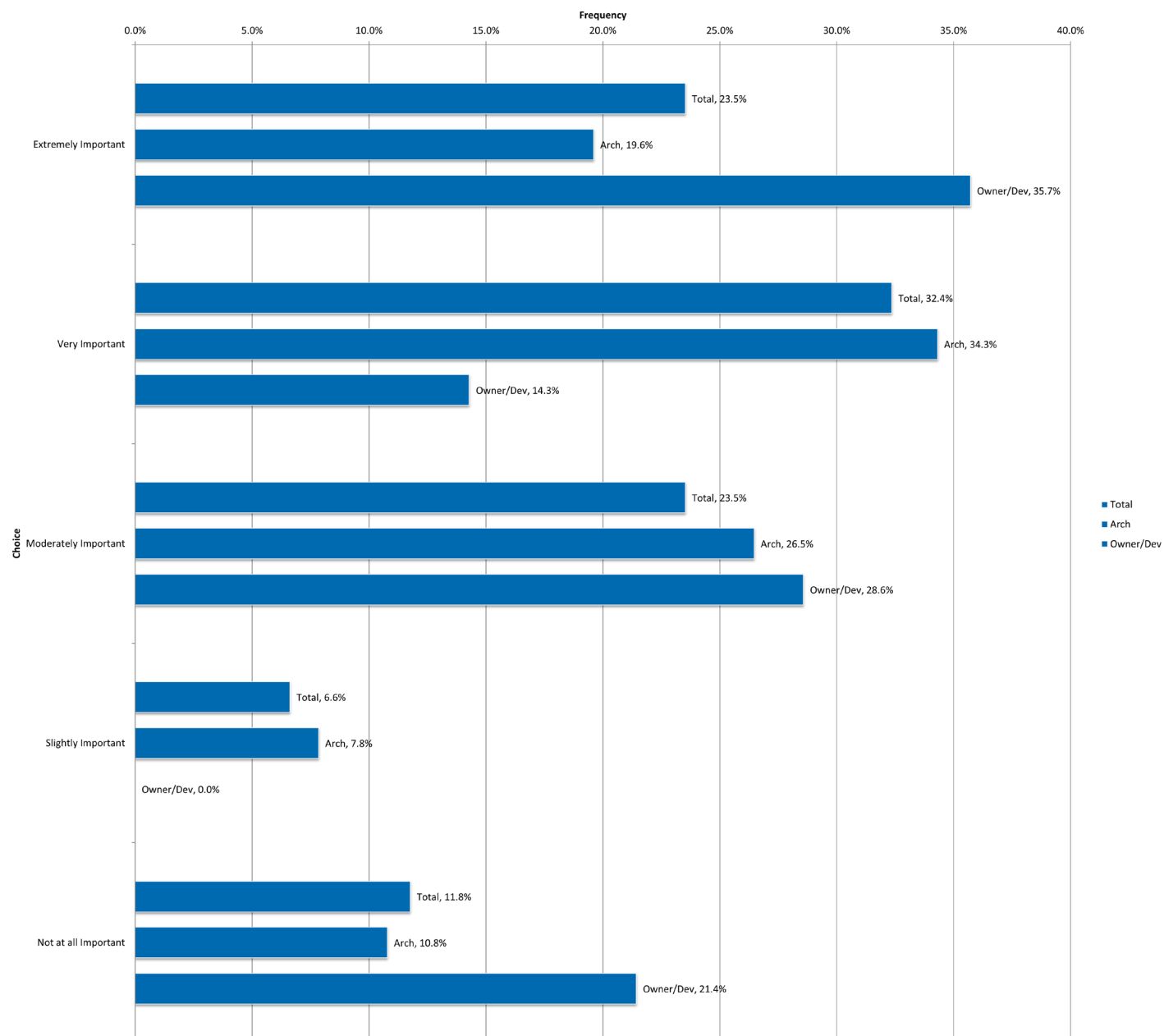


Which of the following do you consider vegetative green roofs as a **PROBLEM SOLVER** for?

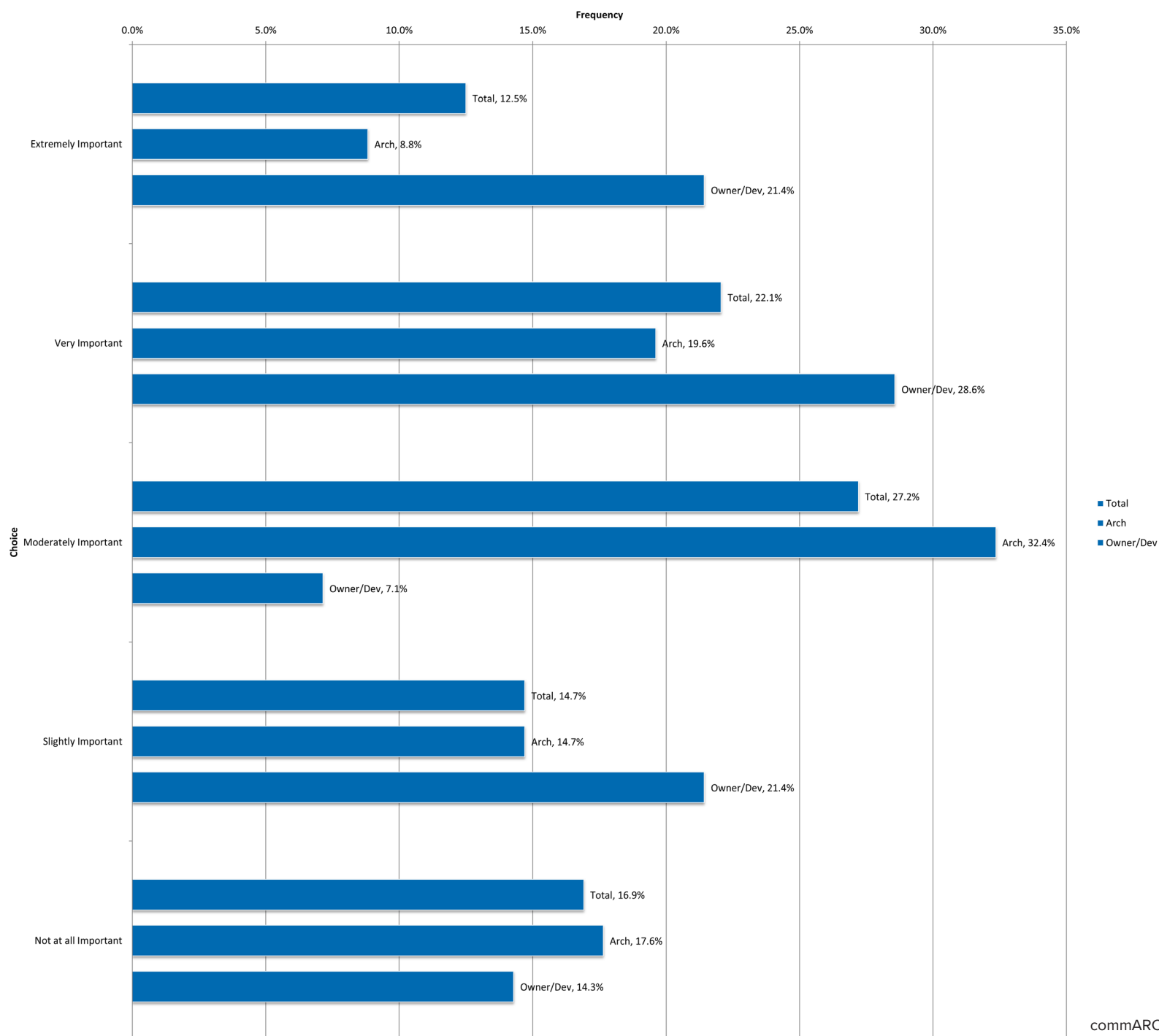
How important is BUILDING-TYPE when deciding to incorporate a vegetative green roof in a new or existing building?



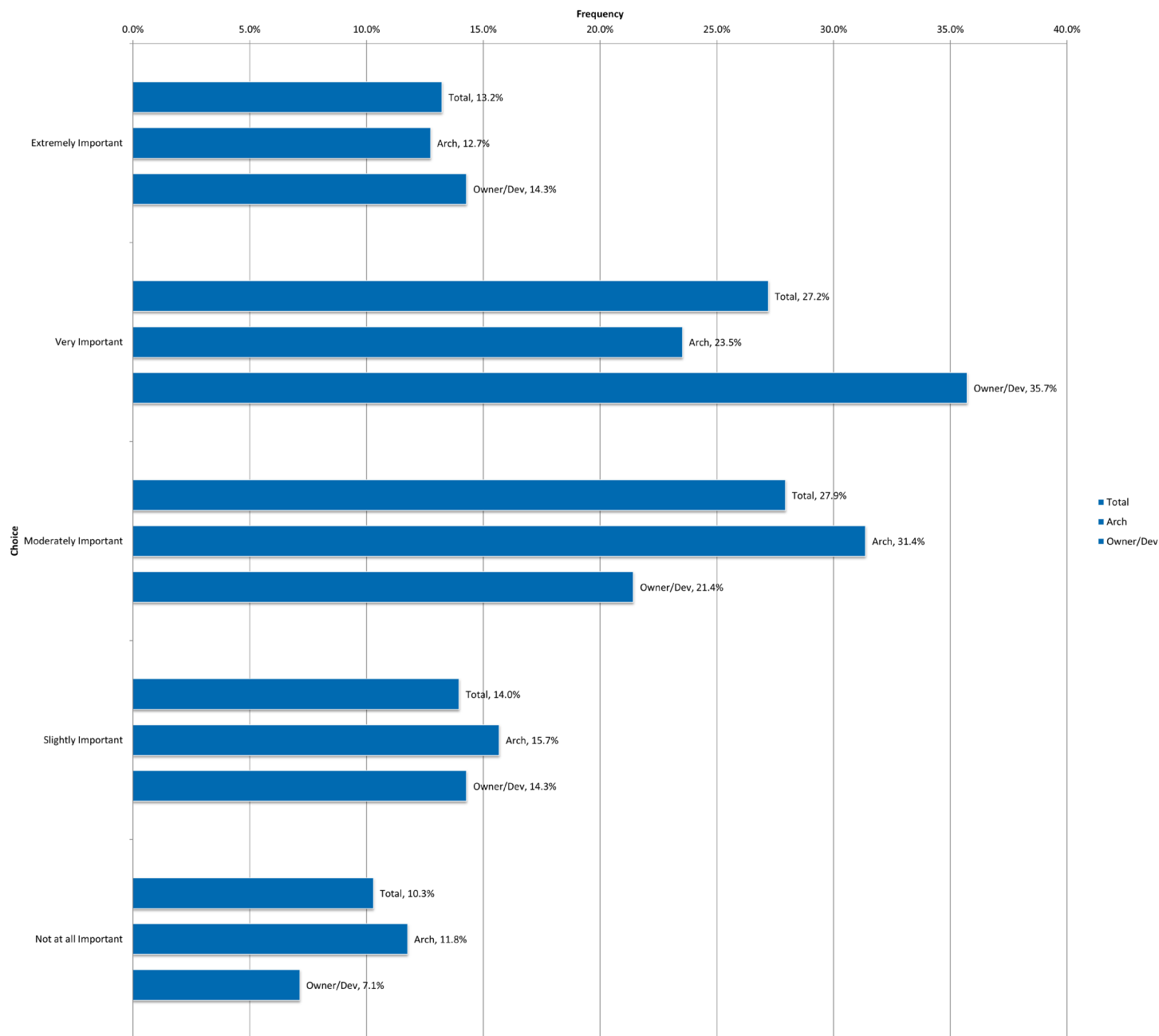
How important is “EXTENDED ROOF LONGEVITY” when deciding to incorporate a vegetative green roof in a new or existing building?



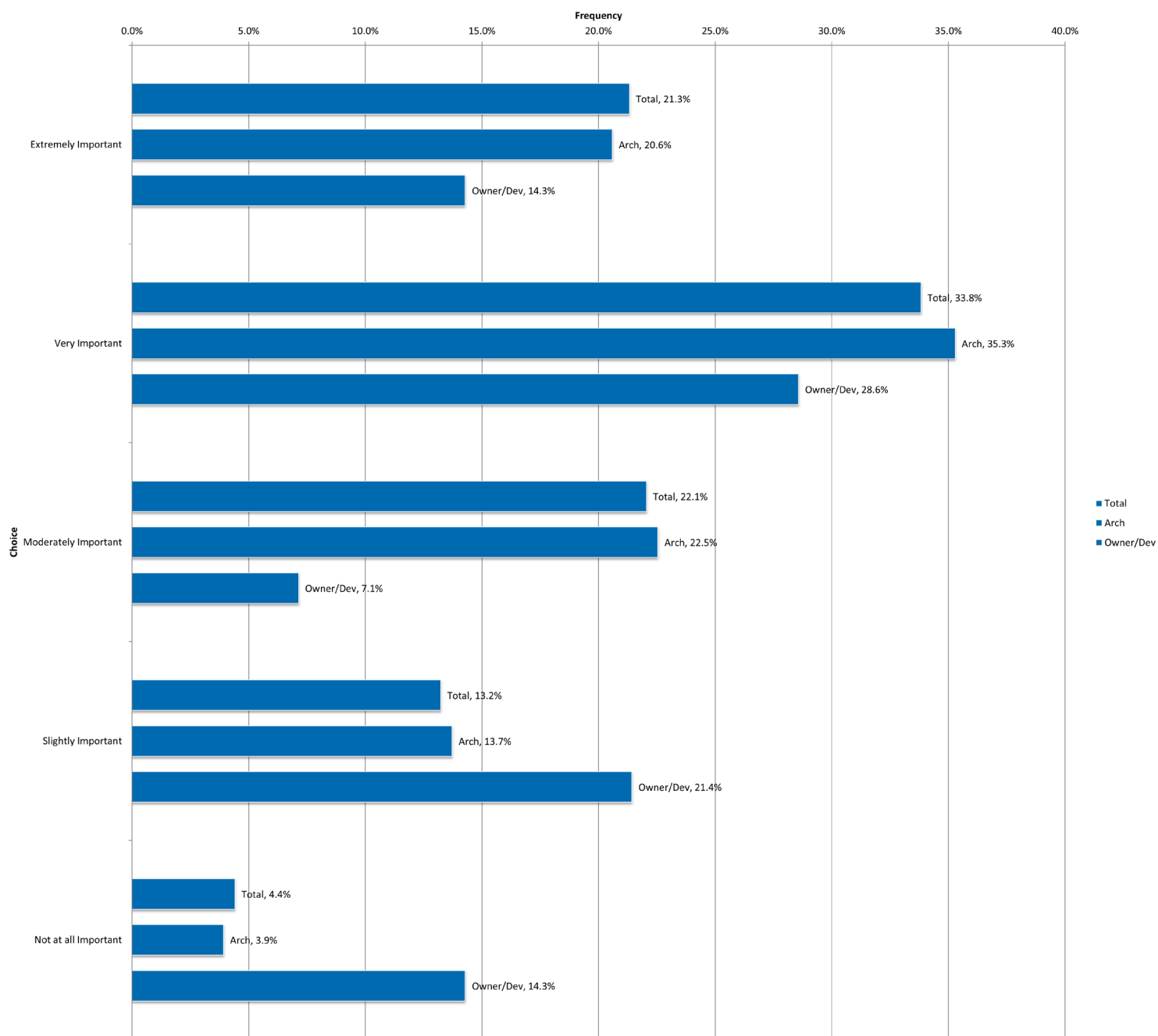
9 How important is “PV SOLAR PANEL EFFECIENCY IMPROVEMENTS” when deciding to incorporate a vegetative green roof in a new or existing building?



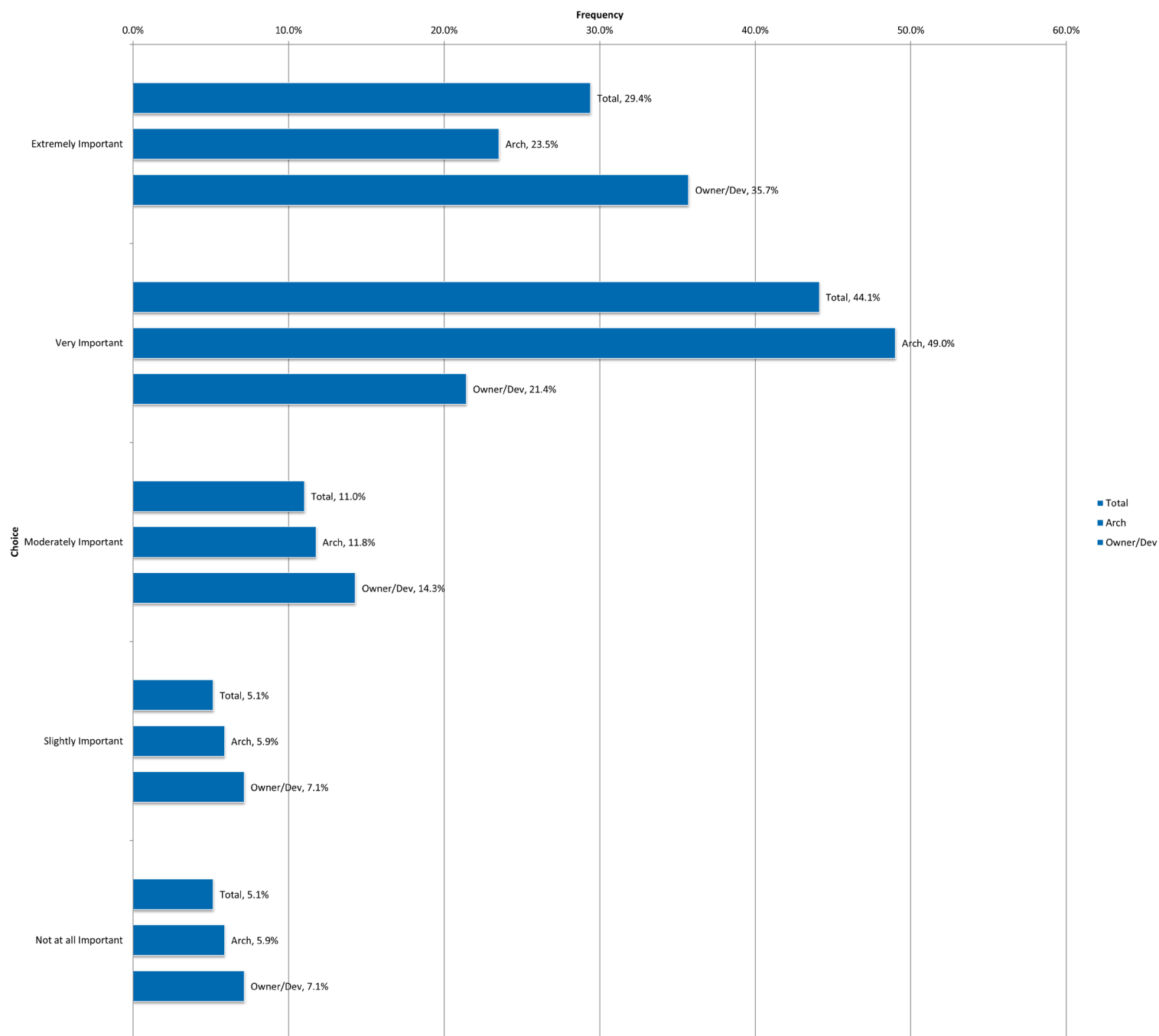
How important is “ADDED PROPERTY VALUE” when deciding to incorporate a vegetative green roof in a new or existing building?



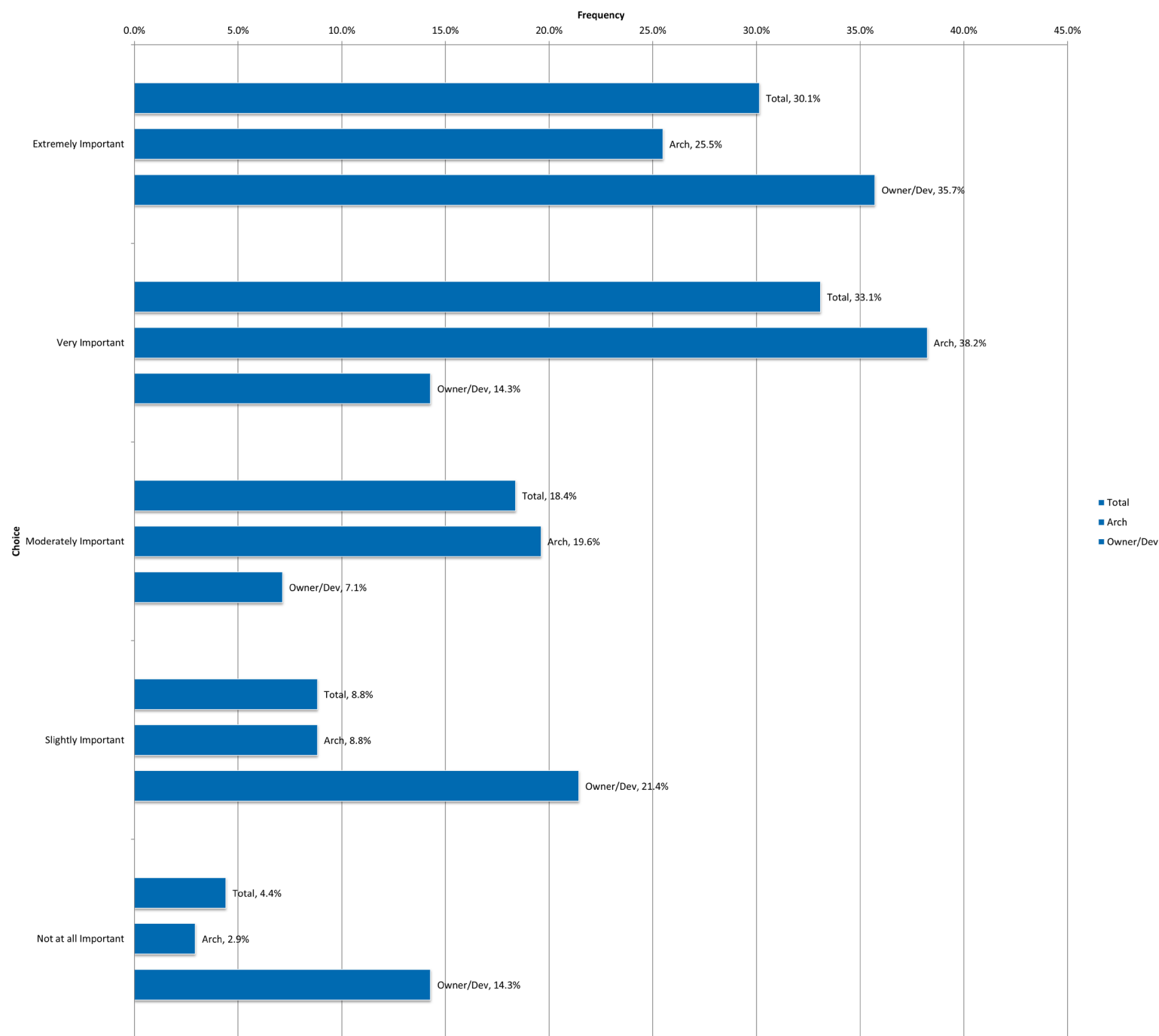
How important is "ADDED USABLE SPACE" when deciding to incorporate a vegetative green roof in a new or existing building?



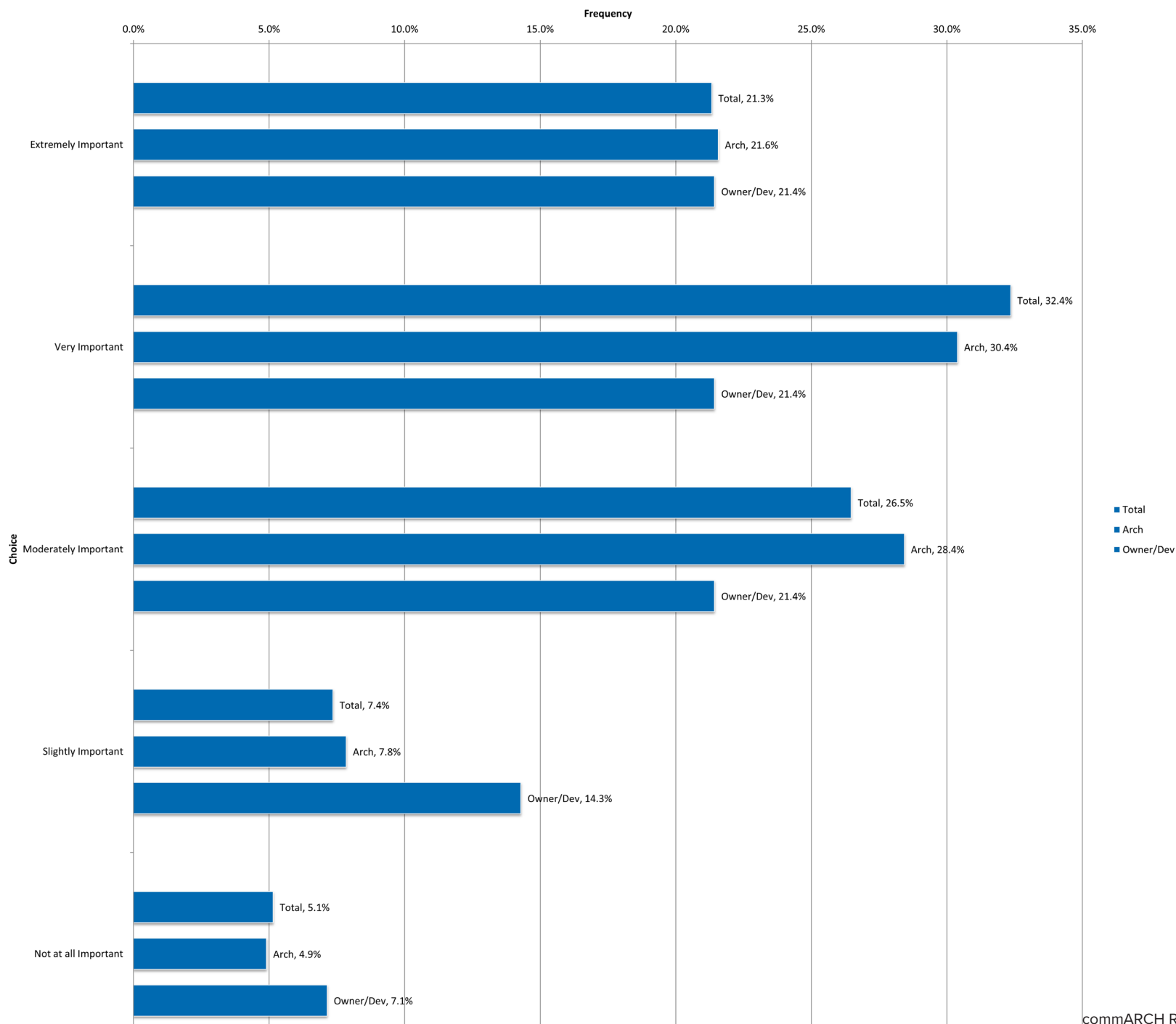
How important is “REDUCED COOLING COSTS” when deciding to incorporate a vegetative green roof in a new or existing building?



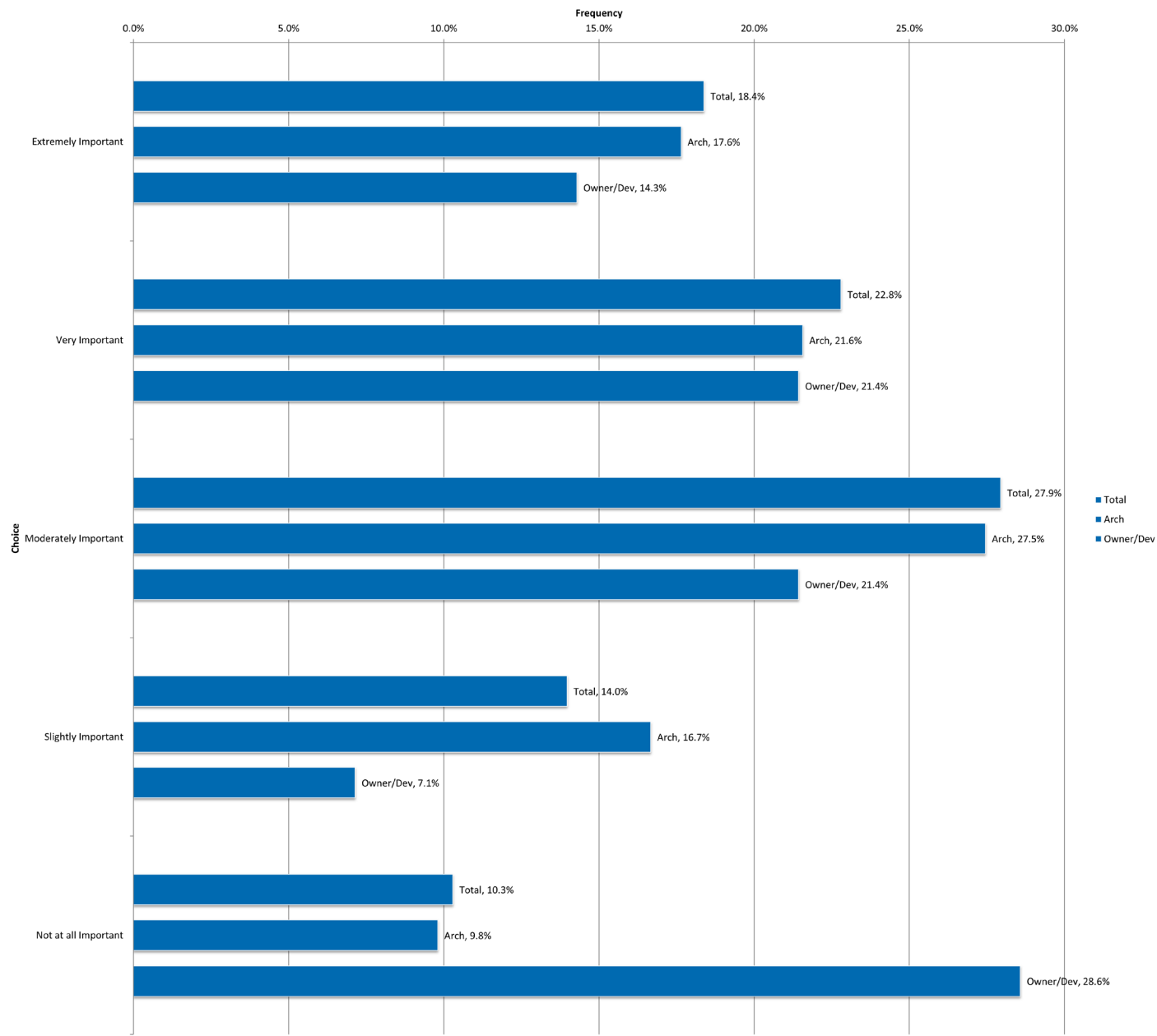
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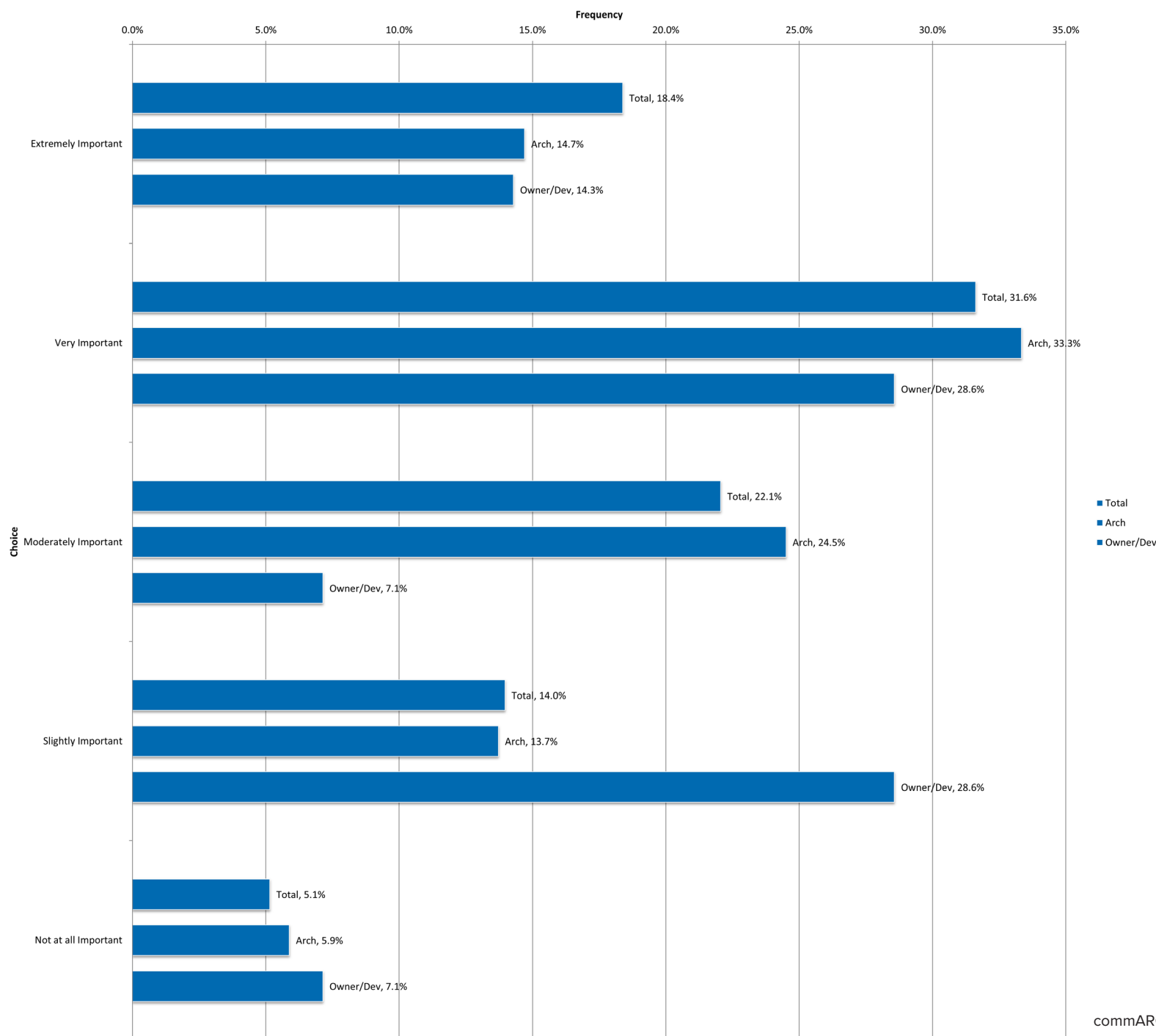
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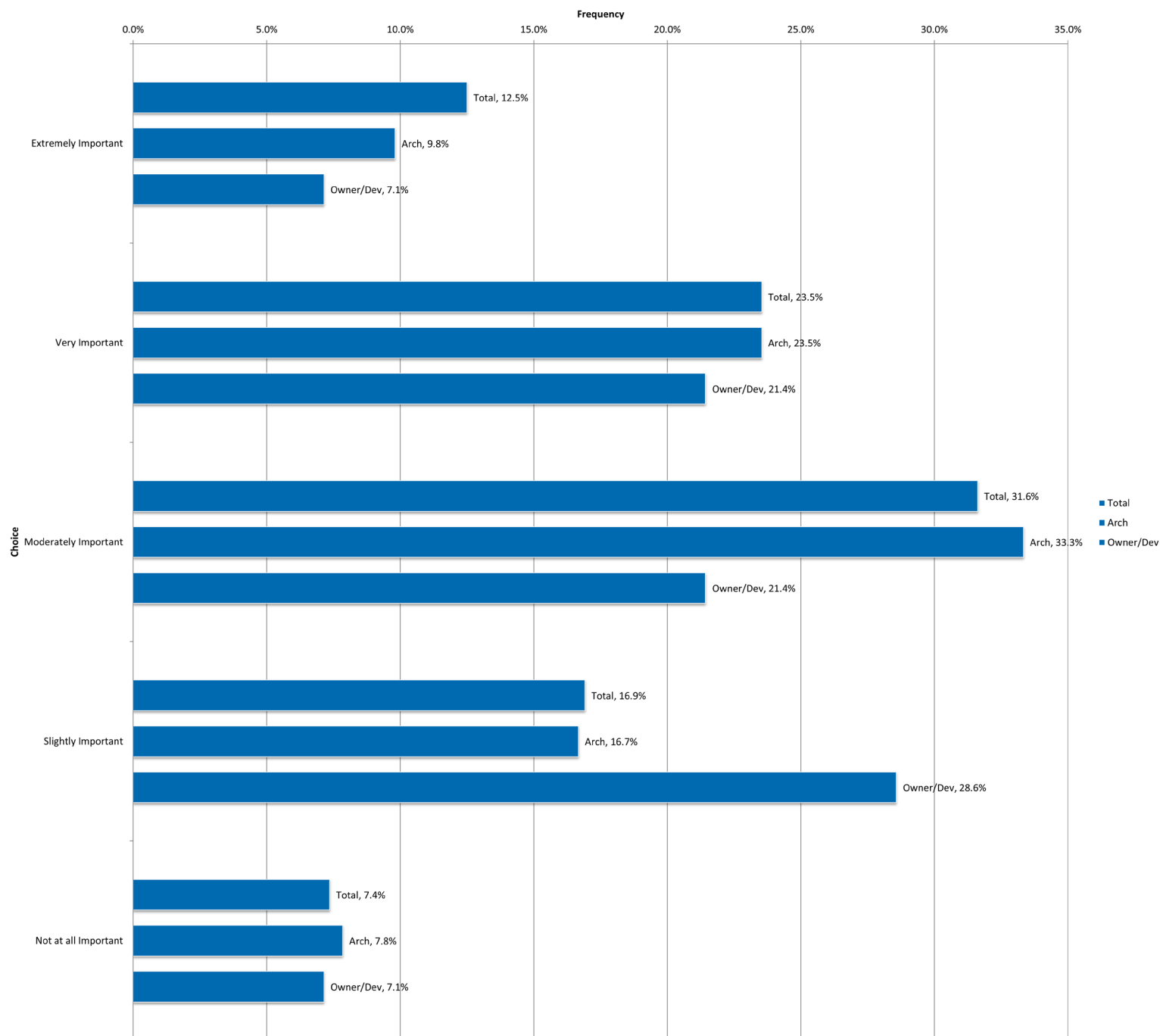
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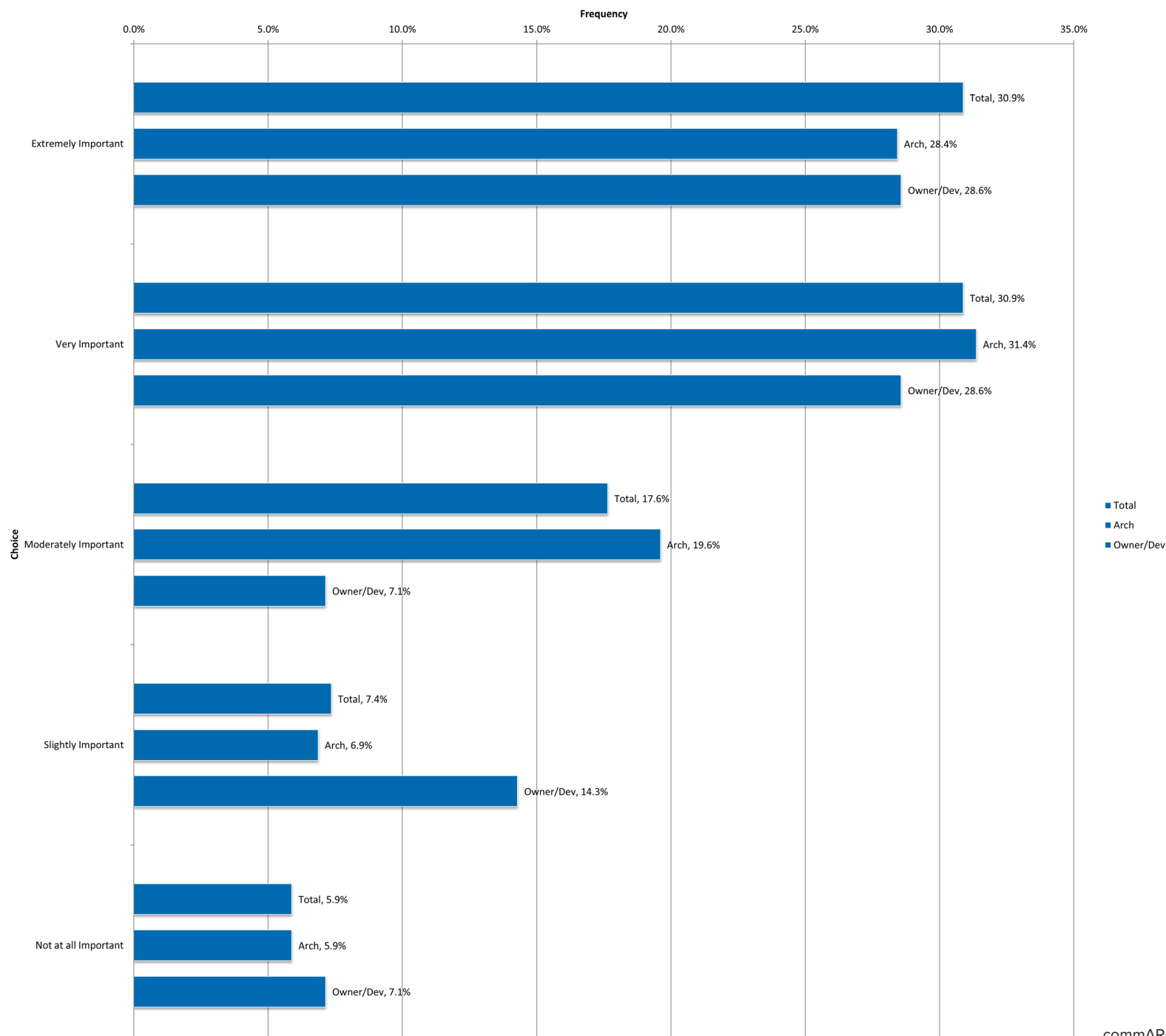
How important is "HEALTH & WELLNESS" when deciding to incorporate a vegetative green roof in a new or existing building?



How important is “NOISE REDUCTION” when deciding to incorporate a vegetative green roof in a new or existing building?

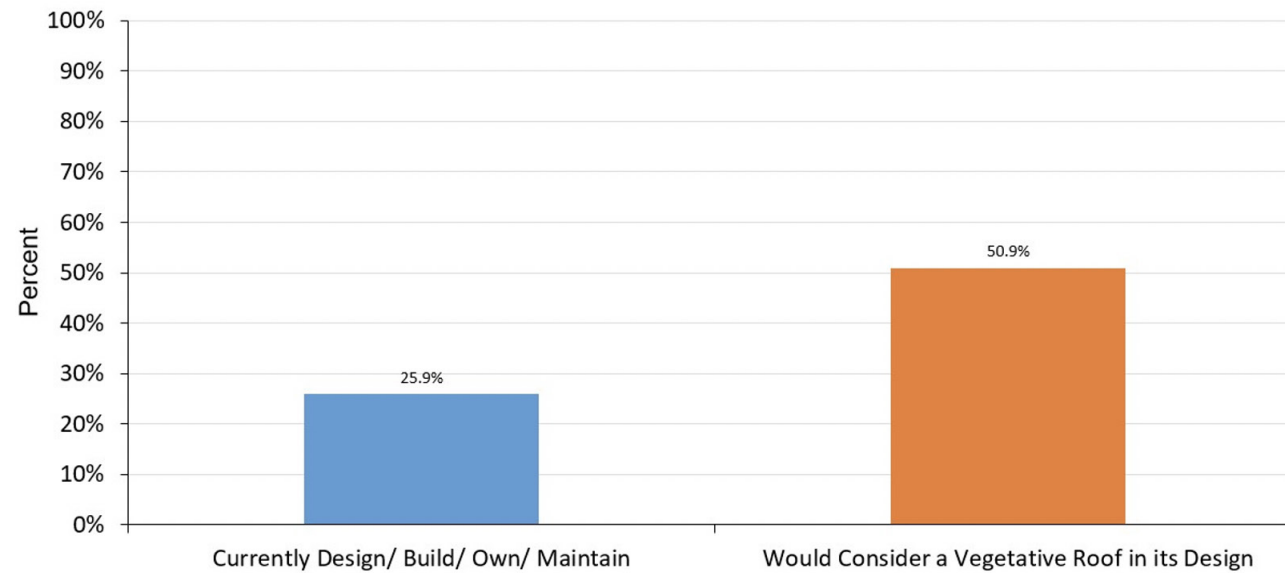


How important is "GEOGRAPHIC LOCATION" when deciding to incorporate a vegetative green roof in a new or existing building?

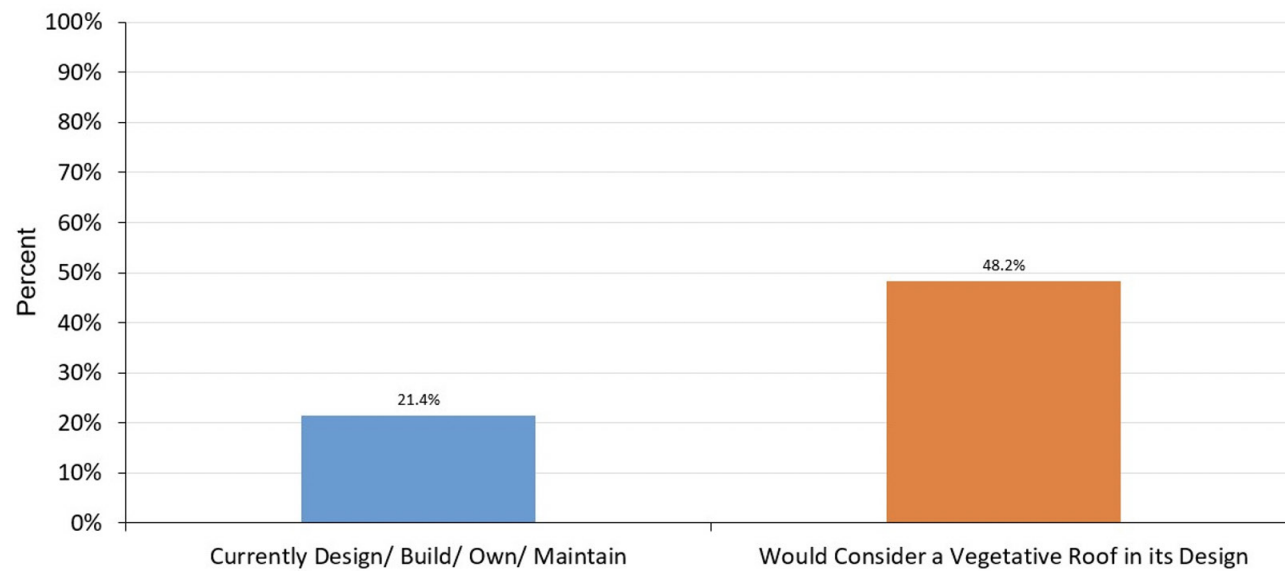


Which of the following BUILDINGS would you consider a vegetative green roof to be applicable?

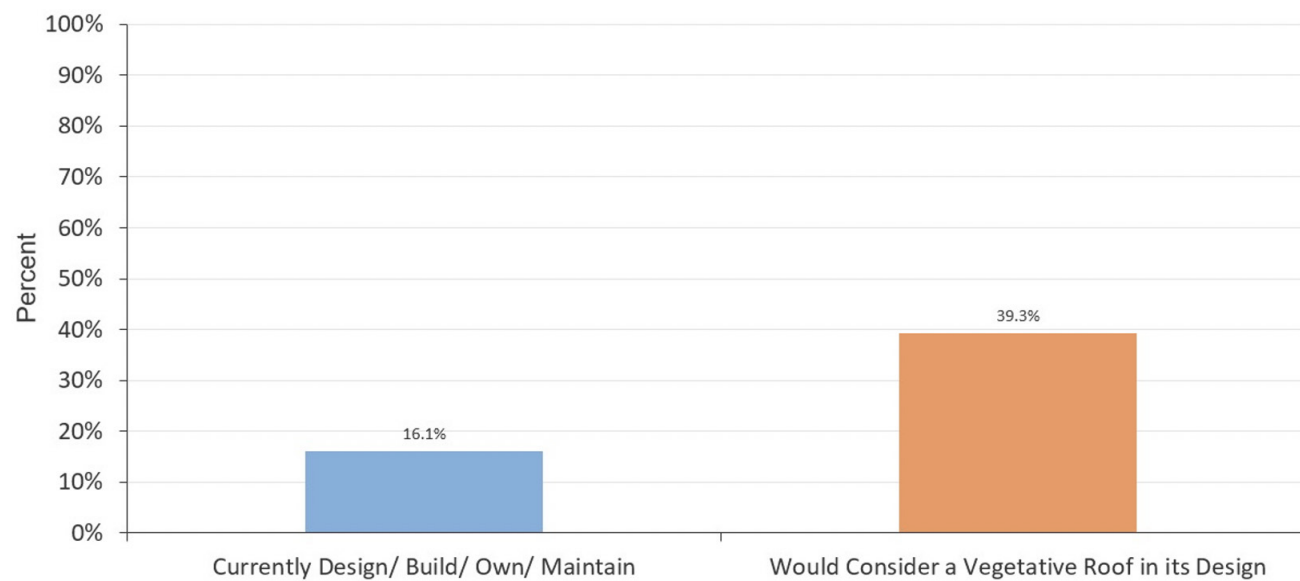
Education



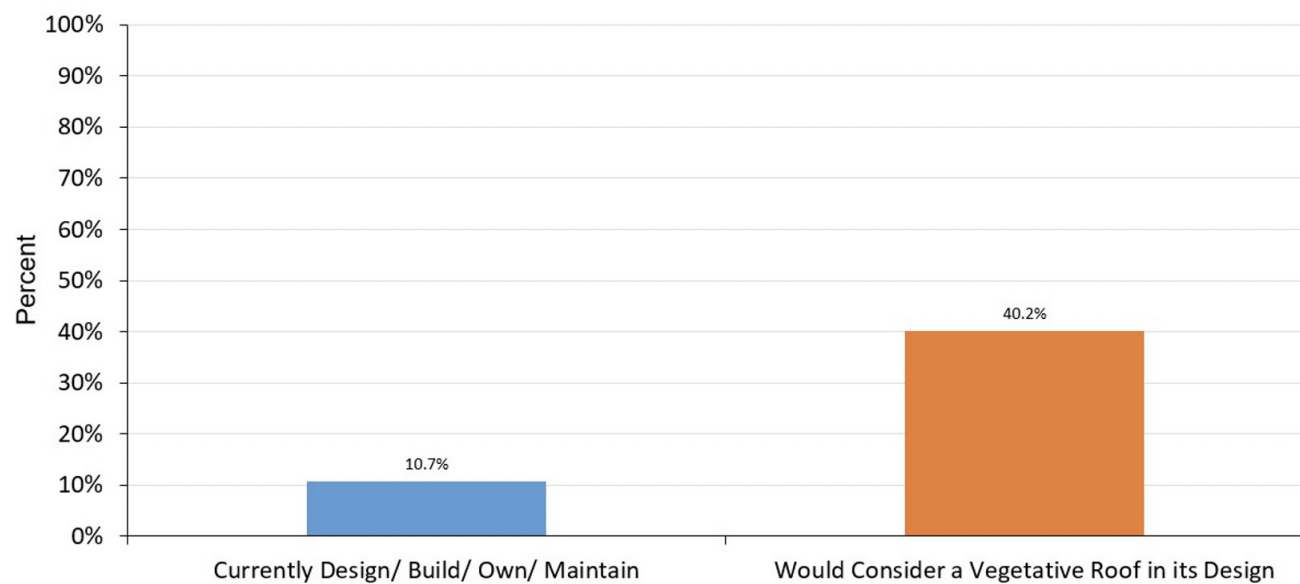
Government/Municipal



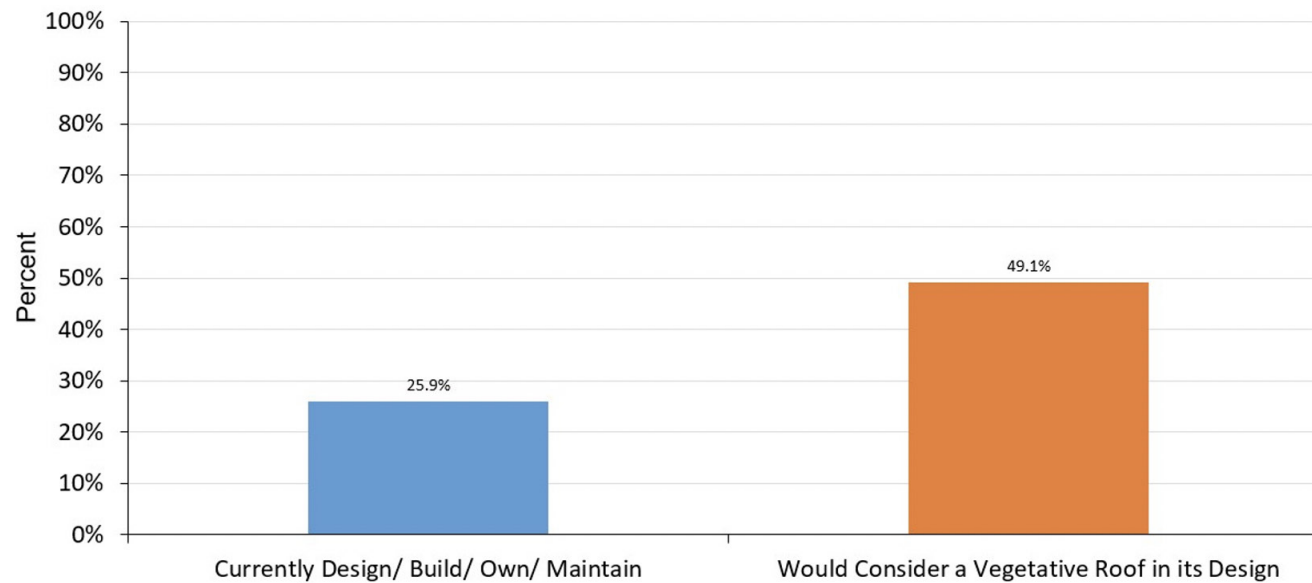
Healthcare



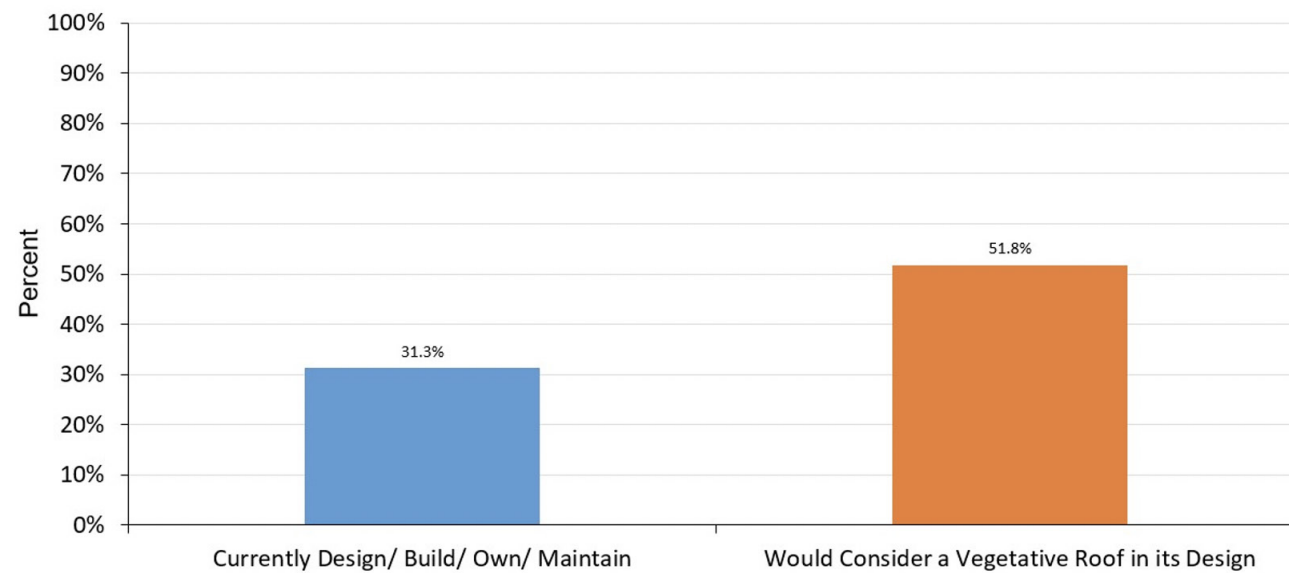
Hospitality



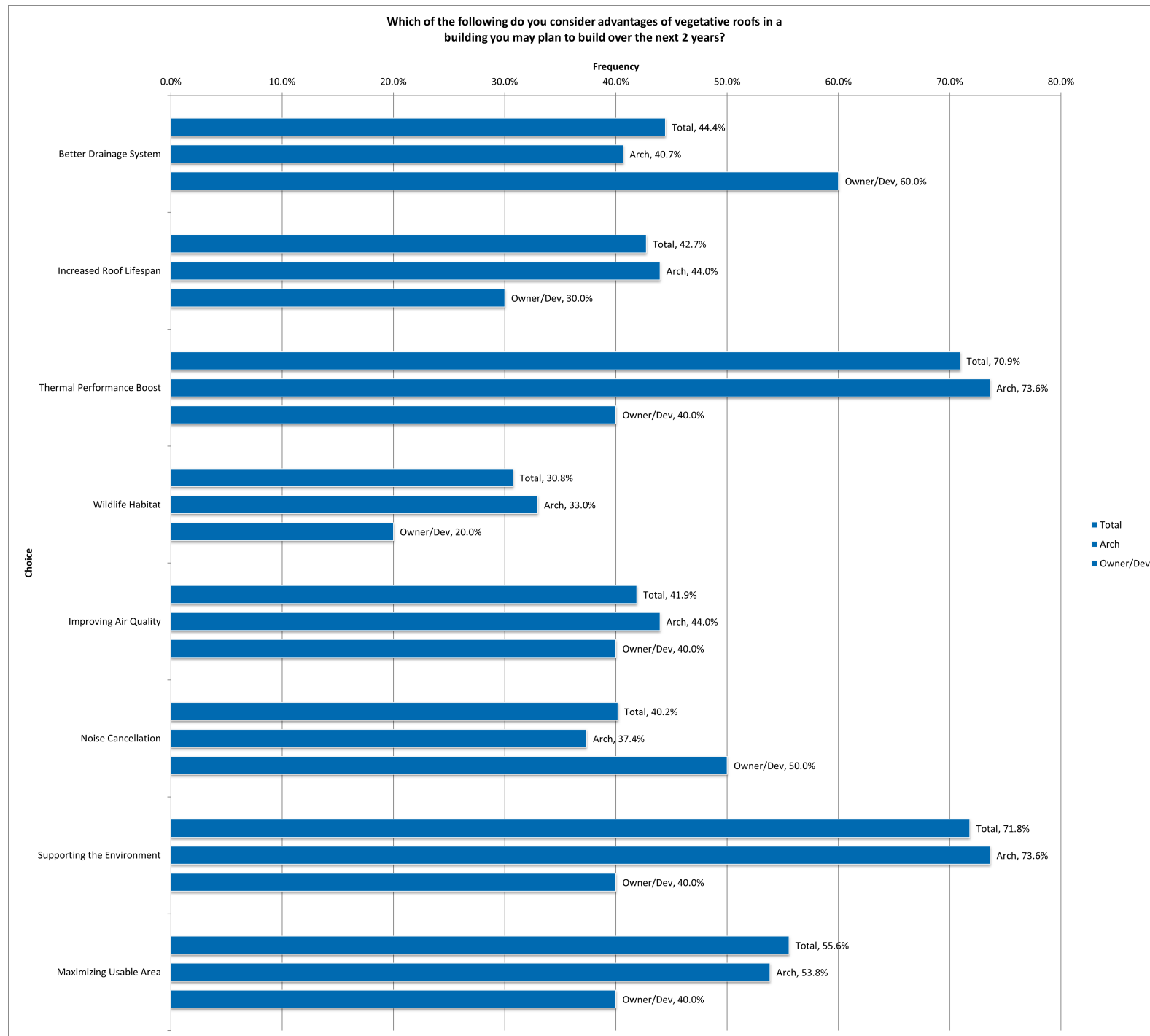
Mixed-Use



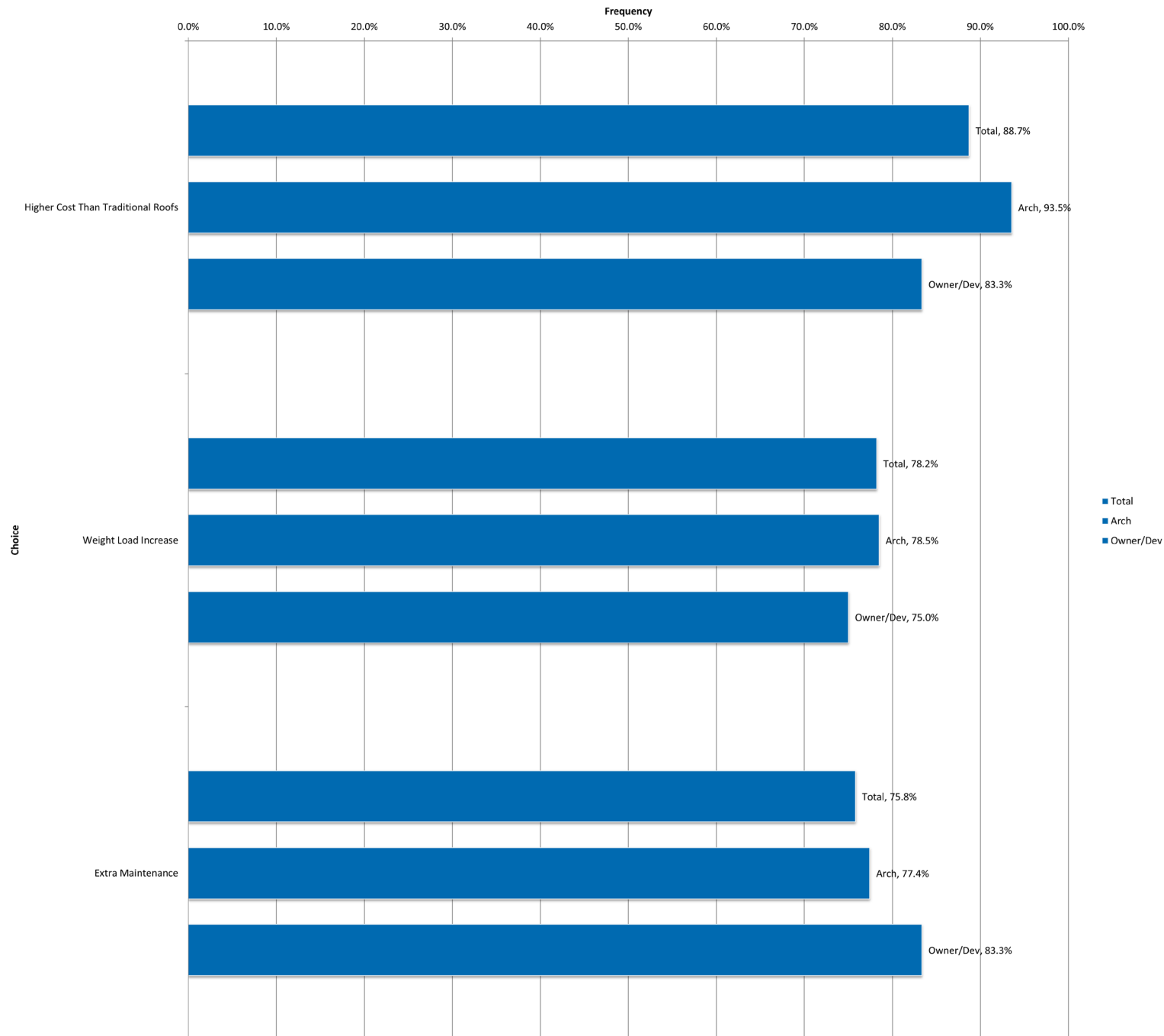
Office



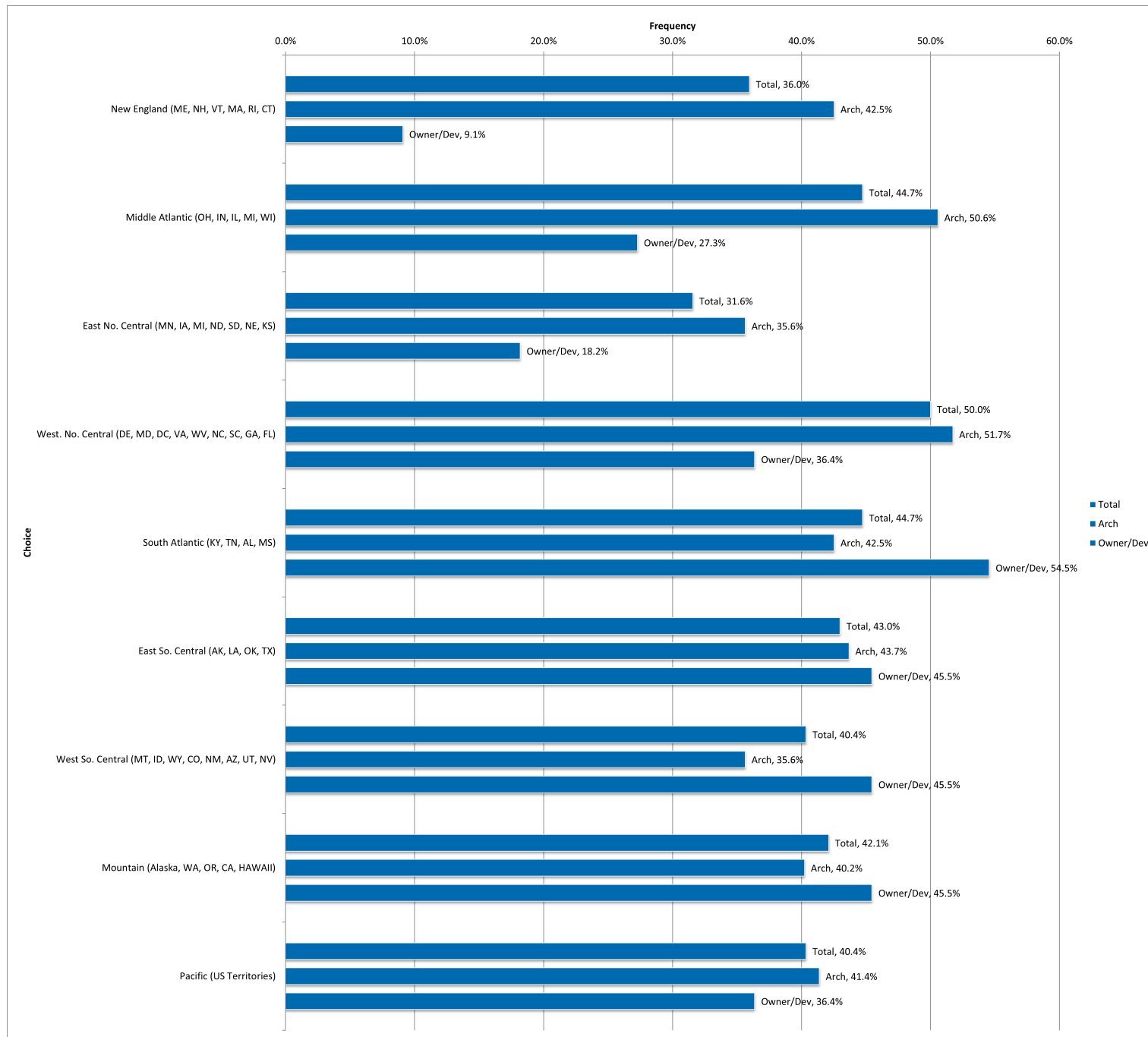
What would you consider **ADVANTAGES** of vegetative green roofs for a building you may plan to build over the next 2 years?



What would you consider potential DISADVANTAGES of vegetative green roofs for a building you may plan to build over the next 2 years?



What GEOGRAPHIC areas of the United States would you recommend vegetative green roofs for a building?



OWENS CORNING'S COMMITMENT TO VRAS

Vegetative Roof Assemblies (VRA)s help buildings comply with stormwater management codes, reduce heat island effect, and prevent wear on roof membranes to prolong roof life, increase usable space, and reduce energy usage. Below are a few VRAs relying on Owens Corning® FOAMULAR® XPS insulation to support performance and sustainability:



The Wharf, D.C.

Over half of the roofs in The Wharf's mixed-use project rely on a Protected Roof Membrane Assembly (PRMA) to help achieve the District's stormwater management mandates. Rooftop vegetation helps serve as a sponge absorbing rainwater, while the water resistance of XPS helps the VRA retain its R-value. High compressive strength allows the insulation and overburden above on top of the waterproofing to withstand the weight of vegetation, saturated growing media, and pavers. Insulation and overburden are placed on top of the waterproofing membrane, directing water laterally to a series of overflow vaults. This system effectively moves stormwater to a network of 700,000-gallon cisterns throughout the District. Photo Courtesy: The Wharf, Washington, DC



The Douglas Munro Coast Guard Headquarters

Covering 550,000 square feet, this VRA retains up to 424,000 gallons of rainwater and uses a stair-stepped terrace design to gradually direct water through 120 feet of elevation changes. Beyond managing rainwater, the roof encourages biodiversity, natural habitat, and reduces energy requirements.

Roof designers utilized Owens Corning® FOAMULAR® XPS and relied on a complex network of expansion joints to accommodate multiple roof transitions. The building is a magnet for engineers, designers, and landscaping groups interested in its design, performance, and sustainability profile. Photo courtesy: The Douglas Munro Coast Guard Headquarters



Dickies Arena

Home to a world- renowned rodeo and massive outdoor space, the multi-purpose plaza deck must be able to recover from a Texas-sized drenching quickly. The plaza deck must also support the weight of pavers, furnishings, vehicle traffic and vegetation. The 140,000-square-foot deck includes layers of Owens Corning® FOAMULAR® XPS reverse tapered insulation to create a flat surface; flat fill insulation to raise the overall height of the roof; and tapered insulation to slope to the drains embedded in the top roof layer. This accommodates less obtrusive surface drains that tie into a network of robust subsurface drains at in the structural slab. This allows the height of the plaza deck to be roughly 1' above the structural deck without the weight that concrete would require to fill that same height, creating more open, column-free space in arena areas below. Photo Courtesy: Dickies Arena, Trail Drive Management Corp

What's next? Owens Corning's FOAMULAR® NGX™ brings a new level of sustainability to VRAs.

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RESEARCH

commARCH Research Group
IdeaSoil, LLC
228 Park Ave S, PMB 60794
New York, NY 10003

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With a primary focus on the success of the architect and owner/developer relationship, **commARCH** has established itself as a leading information provider. Its **Research Group** helps building product manufacturers, advertising and marketing agencies, technology platforms, service providers, architects, building owners, developers, contractors, engineers, consultants and associations with insights into what resonates with their customers, customer's customers, end-users, and employees. Qualitative and Quantitative omnichannel methodologies offer the industry an assortment of in-depth, actionable market research studies. These include: Pre-/Post-Campaign, Brand Perception, Marketing Feedback, Ad Perception, Customer Experience Monitoring, Voice-of-Customer, General Occupant Need Evaluations, Specific Occupant Need Assessments and Recommendations, 2-Year Post-Occupancy Studies, Process Evaluations, Digital Performance Reports, Competitive Spend Analysis and Social Media Audits.

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