

A collection of wooden blocks and a cylinder, some painted white or light blue, arranged on a white surface. The objects are scattered across the frame, with some standing upright and others lying flat. The lighting is soft, creating gentle shadows. The text is overlaid on the left side of the image.

Color × Health

Affordable Housing Starts
with Healthier Spaces

FIRST STEP: USE HEALTHIER PAINTS

Healthy Materials Lab

The Healthy Materials Lab at Parsons School of Design is dedicated to a world with human health at the center of all design decisions.

We're committed to raising awareness about toxics in building products, and to creating resources for the next generation of designers and architects—all in order to make healthier places for people to live.

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Brazilian Blue 817
Benjamin Moore | Aura Waterborne interior paint | eggshell finish
Barn Swallow Color Palette

Our Goals



In the broadest sense,
our goals are for healthier spaces
and healthier lives.

To achieve this, we strive to:

- 1 Improve today's commonly used materials to reduce exposure to toxics and improve health.
- 2 Foster knowledge and awareness of today's healthier material alternatives—make them more marketable, accessible, and popular.
- 3 Invent, test, and implement tomorrow's healthy materials.
- 4 Work with manufacturers to promote transparency and drive innovation.
- 5 Create healthier homes for people living in poverty.

More and more studies show that building materials directly affect human health. Healthy Materials Lab is focused on the most critical issues facing the most vulnerable populations.



Parsons Donghia Healthier Materials Library

Why healthy materials matter

How do materials release chemicals?

Many building materials appear stable and sturdy on the surface. But these same materials look drastically different on a molecular scale. If you were able to zoom in with a microscope, you would see chemicals released as dust, fumes, and liquid-soluble compounds. These chemicals can enter our air, food, and water supplies, and therefore increase our risk of potential exposure.

Volatilization is the process by which chemicals are vaporized and released into the air. It is common amongst wet applied materials, such as adhesives, paints, and finishes.¹

Abrasion is any scratching, scuffing, or rubbing-away of a material that results in the release of small particles and dust. It can occur in recognizable fade and wear patterns.²

Leaching occurs when material contents are released—or leached—directly into liquids. Water- and oil-soluble compounds have the potential to contaminate food and drinking supplies, and may be more easily absorbed through the skin.³

Oxidation is a metabolic process that occurs with reactions like burning and rusting, which can release harmful byproducts into the environment.⁴

The selection of healthier building products is a critical step towards reducing NYC's alarming rates of childhood asthma.



Reviewing color choices at Murphy Children's Center

How can chemicals get into your body?

After chemicals have been released into our environments, there are a variety of ways they can get into our bodies. These “routes of exposure” can be: (1) direct, through contamination to the air we breathe or food we eat, or (2) absorbed, through oils in the skin, or (3) consumed unintentionally, through hand-to-mouth contact.



Inhalation exposure can result from breathing polluted air, which brings toxics from dust, vapors, aerosols, and other particulates into the respiratory system. Some substances—like asbestos—can become permanently lodged in the lungs’ tissue, leading to cancer and a variety of respiratory diseases.¹



Ingestion (eating and drinking) exposure can occur through the eating or drinking of contaminated substances, such as water, which can leach chemicals from pipes—or canned food, which can leach chemicals from the container’s BPA lining.²



Ingestion (hand to mouth) exposure may also occur inadvertently through hand-to-mouth contact that leads to the consumption of soil, dust, or other chemical residues. Children with frequent hand-to-mouth activity are especially vulnerable to this type of ingestion exposure.³



Dermal Absorption: Toxic substances can be absorbed through oils in the skin and hair follicles. These exposures can come from contact with contaminated soil, dust, water, or consumer products. Children—who have greater contact with floor surfaces where contaminants tend to settle—are particularly vulnerable to dermal exposure.⁴



Placental transfer: Many chemical compounds are able to pass through the placental membrane, transferring hazardous toxics from mother to developing fetus. These chemicals include toxic flame retardants, lead, Teflon compounds, and BPA.



Breastfeeding: Mothers who have been exposed to toxic chemicals can pass these contaminants through their breast milk to newborns. The high-fat content of breast milk can attract heavy metals in particular, and has also been shown to transmit BPA, PBDEs, PFCs, and other harmful chemicals.⁵

City data shows that youth and children living in the Bronx suffer from staggering rates of asthma hospitalization. The rate of emergency room visits for children ages 0-17 in the Bronx was 444.2 per 10,000 – nearly twice the overall city rate for the same age group.¹

What are some potential effects on health?

After entering our bodies, substances are processed and metabolized in different ways. Some can pass right through; others may irritate sensitive areas, or interrupt bodily systems— affecting organ function, hormone regulation, or neural firing. Still others are incompatible with human metabolism, and therefore unable to be processed— these build up over time, and persistently affect our health with systemic and life-threatening consequences.

Asthma is a respiratory disease that has been linked to chemicals commonly found in paints, adhesives, floors, carpet, and foam insulation. Rates of asthma have been growing since 1980, with nearly 26 million people affected today, including 8 million children.²

Cancer has been linked to chemicals such as cadmium, lead, and mercury—metals commonly found in a variety of building materials. While cancer is the second leading cause of death in the US, many of these cases may be preventable through limiting exposure to toxic chemicals.³

Infertility: Exposure to environmental pollutants presents the greatest threat to reproductive health, with links to reduced fertility in both men and women. Of particular concern are chemicals that disrupt the endocrine system, like BPA's and phthalates, which interfere with hormone activity.⁴

Premature birth: Neonatal exposures to indoor air pollutants have been linked to preterm birth, the leading cause of infant mortality worldwide. These pollutants are released by a variety of materials, such as VOCs from paints and adhesives, and urea-formaldehyde from furniture and cabinetry.⁵



Sea Anemone Color Palette at Murphy Children's Center

Who's affected?

Autism Spectrum Disorder (ASD), a disorder now affecting 1 in 68 American children, is associated with a variety of environmental factors, including prenatal exposure to certain pesticides, mercury, BPA, and early childhood exposures to air pollution.⁶

Obesity: Certain chemicals that disrupt the endocrine system have been shown to affect obesity, particularly in children who have been exposed early in development. These chemicals include PFCs (perfluorinated chemicals) and flame retardants, which are often used in treatments for upholstery, carpeting, and foam insulation.⁷

Some people are more susceptible to the effects of harmful materials than others. People whose physical organs are still forming—such as children and teenagers, or the fetuses of pregnant mothers—are particularly vulnerable. People who live or work near industrial pollution, environmental pollution, or air pollution may also suffer from high exposure.

Various factors—including age, health predispositions, and socio-economic circumstance—render certain populations more vulnerable to toxic exposures with greater repercussions to their long term health. People who work within the construction industry—such as manufacturers and contractors, as well as maintenance and custodial staff—may also face increased exposure to potentially toxic products. The Healthy Materials Lab "demonstration project goals" directly targets these various groups.

“Using better, healthier building products in minor building renovations can make a big impact on the lives of residents and provide concrete evidence for change.”

Alison Mears, Director of HML



Selecting healthier material and color palette

Demonstration Project Goal

Healthy Materials Lab uses demonstrations to test the properties and performance of materials on-site and in real situations, to promote the use of healthier and more affordable building options. All specifications developed and demonstrated in these projects are shared and available to anyone via our website. Partners and collaborators in projects provide useful input and feedback on tested products, which informs future research and projects. The intention of these demonstrations is to provide useful information on building products—and to increase the use of healthier and more affordable products in homes across the United States.

Introduction

Minor interior renovations can have very positive consequences for residents. Our demonstration projects place human health at the core of materials decisions, prototyping the installation and performance of healthier building materials—such as flooring and paint—and offering product alternatives for the affordable housing sector. We believe that this process will help trigger a change in the way industry leaders and professionals specify, install, and maintain building products.

The project described here is the outcome of an ongoing partnership between HML team members and the New York City Housing Authority (NYCHA). NYCHA is home to not only 177,657 (as of March 1, 2016)¹ apartments and many hundreds of thousands of residents, but also over 300 early childhood centers. HML has been working with NYCHA as well as local educators and administrators to develop minor renovations project for Early Childhood Education and Community Centers. The first project focuses on the Arthur H. Murphy Houses Children's Center in the Bronx.

The selection of healthier building products is a critical step towards reducing NYC's alarming rates of childhood asthma. City data shows that youth and children living in the Bronx suffer from staggering rates of asthma hospitalization. The rate of emergency room visits for children ages 0-17 in the Bronx was 444.2 per 10,000 – nearly twice the overall city rate for the same age group.² In the zip code where the East Tremont Children's Center is located this number rises to 557.7. According to a 2009 NYU-Wagner Graduate School study, the rates of death from asthma in the Bronx are three times as high here as they are in the United States as a whole, and hospitalization rates are almost five times as high.

According to a 2009 NYU-Wagner Graduate School study, the rates of death from asthma in the Bronx are three times as high here as they are in the United States as a whole, and hospitalization rates are almost five times as high.

This project demonstrates that small, incremental changes—like the selection and implementation of alternative paint products—can lead to substantial systemic improvements over time.

The project provides NYCHA with healthier flooring and paint options—and new color palettes—for renovations of their childhood education centers and residential units.

Indicators

Minor renovations of the education center have been well received. Among other early indicators, both administrators and teachers have responded positively to the “brightness” of the center. Future study is needed to establish the longer term impact of this work—and additional projects will enable us to have more samples to evaluate and test the hypothesis that a change in paint provides a range of benefits to the occupants.

1. Health and interior environments

- To assess the healthy upkeep of renovated spaces, we are gathering feedback from maintenance staff, specifically on best practices for keeping materials clean with the use of healthier cleaning products. Historically paints with a high sheen have been equated with cleanliness and ease of cleaning—but we aim to generate testimonials as to how the new paints compare.

2. Health and engagement

- There was moderate engagement with the staff at this facility—all of which provided very useful feedback. In the future, we aim to expand our interaction with the occupants of the demonstration spaces, and will gather feedback from users who have participated in the engagement process—all in order to evaluate qualitatively how this process has impacted their relationship to the space.

3. Health and implementation

- To further understand the impacts of color in an educational facility, we are asking teachers how children and staff are responding to the color choices.
- We are accumulating data on the performance of products at intervals of 1 year and 5 years.

Color Palettes

These color palettes are intended to help residents, educators, and maintenance staff choose paint from among options that have been carefully considered both for early childhood learning spaces and for residential spaces.

With the understanding that color and light can give a positive effect on mental health—and that the choice of healthier paint can give a positive effect on physical health—we have put together two sets of color palettes, selected with future occupants’ health in mind.

Since color choice is subjective, and people see and feel color differently, we believe that the people who occupy spaces everyday should have the opportunity to help select the color of their spaces. This design decision is not only intended to increase user satisfaction, but also to encourage and empower people to have a sense of ownership—to care for their spaces.

HML’s approach to community outreach is to engage people through discussions about color, light, and health—at the project site and beyond. The objective of the manual is twofold: Firstly, we believe in the power of agency. When people have a chance to participate in the shaping of their environment, there is an increased sense of belonging and ownership over space, leading to personal investment and stability in one’s space. Secondly, we hope to reveal the overall positive effect of color and light on mental, physical, and emotional health. Design has the potential to inspire learning and foster a commitment to healthier building practice. Ultimately, our goal is to transform the way renovations are carried out in all of NYCHA operated buildings.

Tonal varieties and ranges of colors in the classroom can add needed complexity, variety, and richness to the environment—which gives children the opportunity to learn about, compare, contrast, and experiment with color.

Paint (Finish) Color and Health

This manual specifies better paint products. For this project, instead of a commonly-used, higher VOC interior paint, the team selected a variety of low- and no-VOC paints, which will minimize the introduction of unnecessary chemicals into the children's classrooms and resident's home.

There is evidence that color evokes moods: repeated studies have shown that value—the amount of light reflecting off the color—and saturation—the intensity of color—both influence emotion.¹ Thus color choice is critical in learning and residential environments, where people spend the majority of their time. While cool colors tend to have a calming effect, and warm colors tend to create warmth and excitement, a consistent extreme of either is not desirable.² The palettes developed by a color expert for this manual are inspired by only natural elements—a series of animals for the daycare centers and natural ecosystems for residential units. We believe that basing these designs on the colors that occur in nature makes the palettes accessible and relatable to our environment.

Paint Color and Education

We know that color has a large impact on early education. For example, the ability to identify colors is considered a marker and milestone in a child's cognitive process

And, since our relationship to color is personalized through the identification of tonal differences, an environment rich in tonality allows children to create their own understanding of what color is to them—their perception of color takes shape through the light, objects, and space that surrounds them. To that end, allowing children to visually engage with color early on imparts a greater understanding of color, one that is rooted in personal experience, which will manifest itself throughout life.

Tonal varieties and ranges of colors in the classroom can add needed complexity, variety, and richness to the environment—which gives children the opportunity to learn about, compare, contrast, and experiment with color. Tonal variety extends to the material qualities of the environment. For example, textures reflect light differently and greatly impact the luminosity of a room by reflecting or absorbing light.

Paint Color and Light

It is well understood that human perception of color is subjective and greatly affected by environmental factors such as light and reflectance. Therefore it is important to consider the overall context in which color is applied.

Daylight access is essential for wellbeing—and greatly impacts indoor quality. Therefore, simple practices like cleaning windows and window guards to allow the most daylight penetration into the interior can be significant for indoor light quality. Further, it is important to maintain fluorescent lighting clean of dirt and grime to maximize lumen output.

Research has shown that students in classrooms with the most window area, or “daylighting,” were found to have 7% to 18% higher scores on standardized tests than those with the least.³ This supports the importance of ensuring access to light while considering its reflectance on color for concentration and mental health.

The basics of a healthy environment are relatively simple—and careful consideration of healthier material choices can easily improve factors like light and air quality. Moreover, the capacity for residents and locals to have choice over design decisions—essentially shaping the way their spaces look and feel—encourages a positive, inclusive environment, the kind of place where a person can really feel that they belong.

This engagement booklet is the first step towards this effort.

Notes

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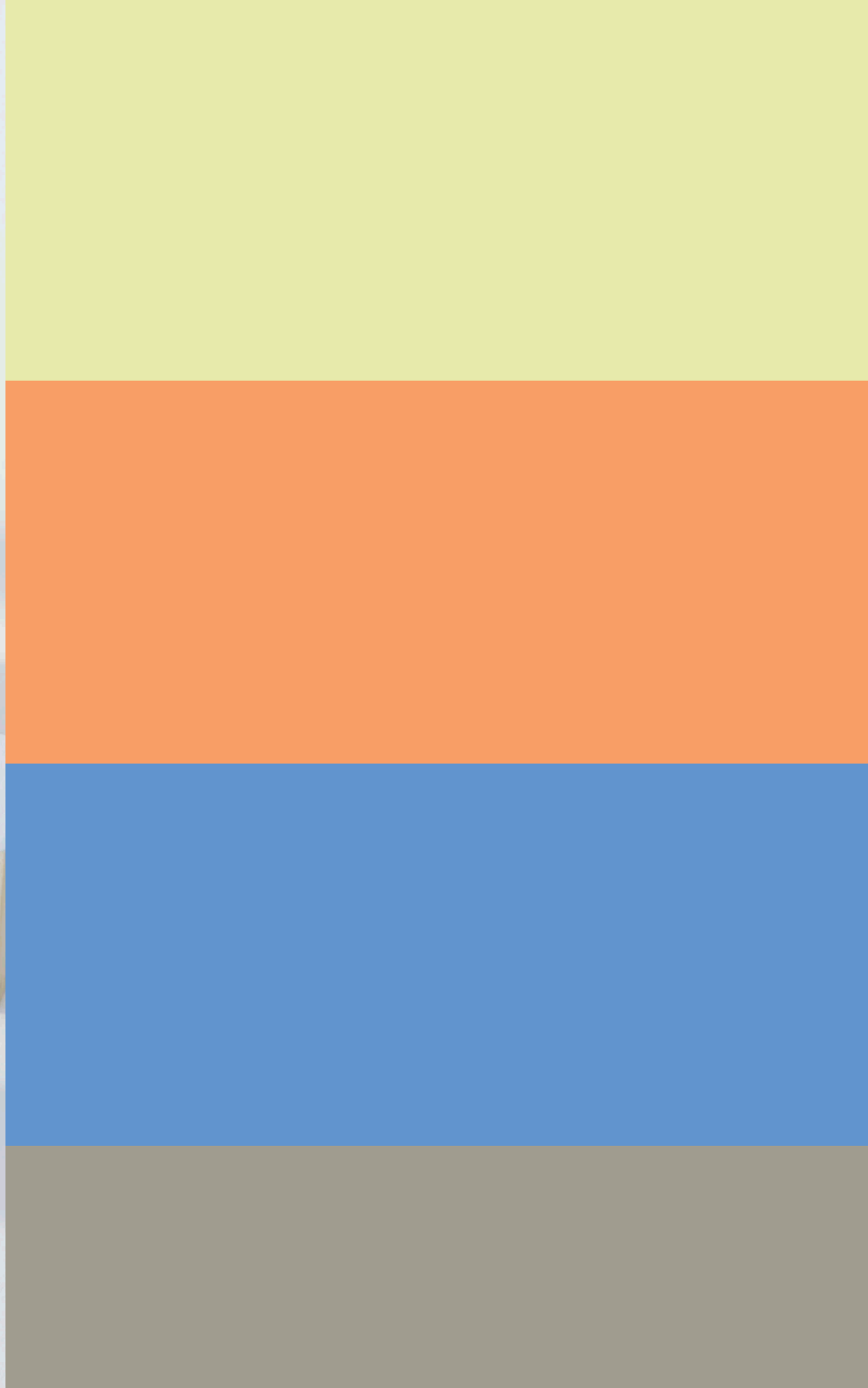
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Daycare Colors: Barn Swallow





Sour Apple 401
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

Sunset Boulevard 082
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

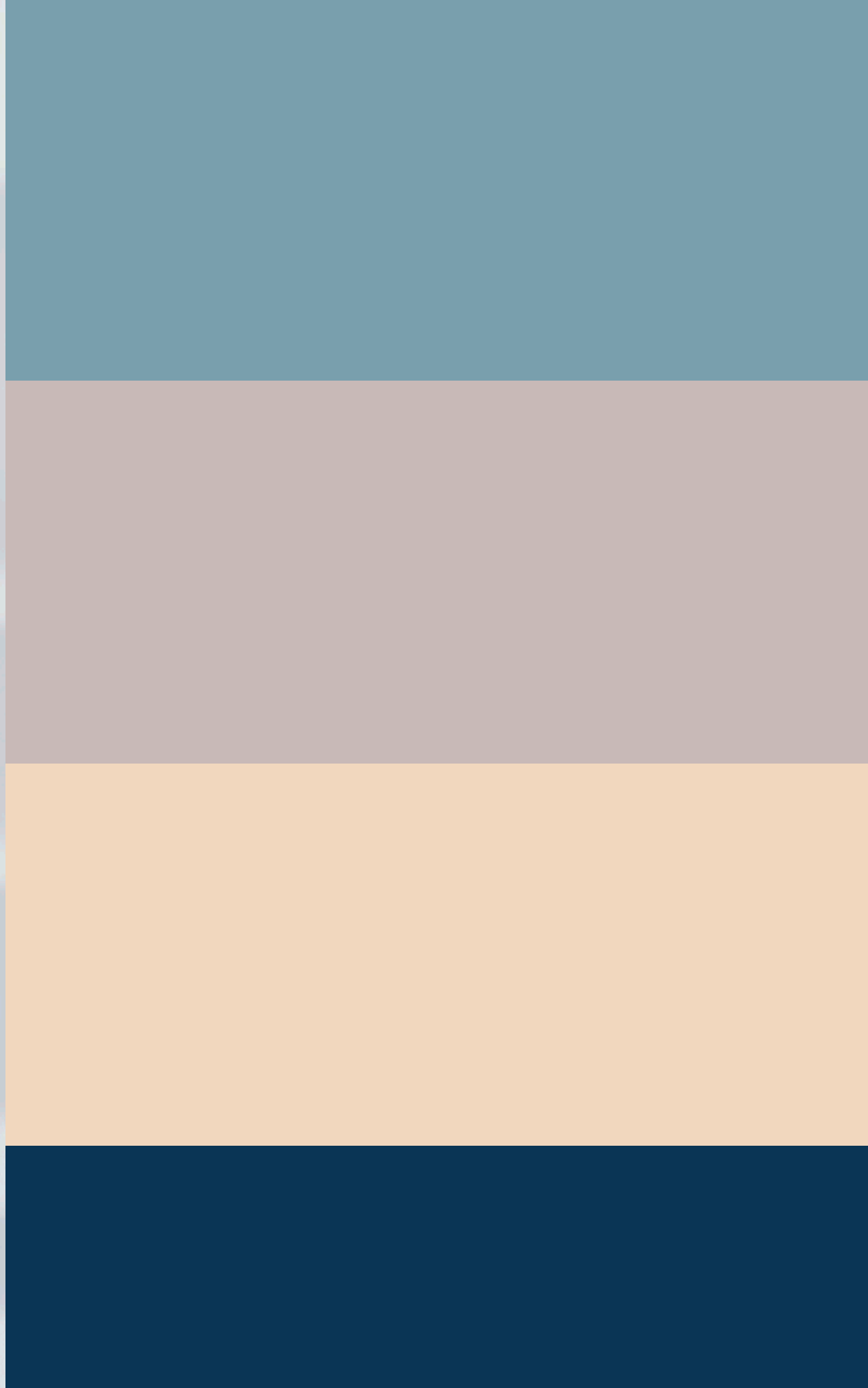
Brazilian Blue 817
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Baseboard: Willow Creek 1468
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

China White PM-20
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Daycare Colors: Jellyfish





CO-244
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

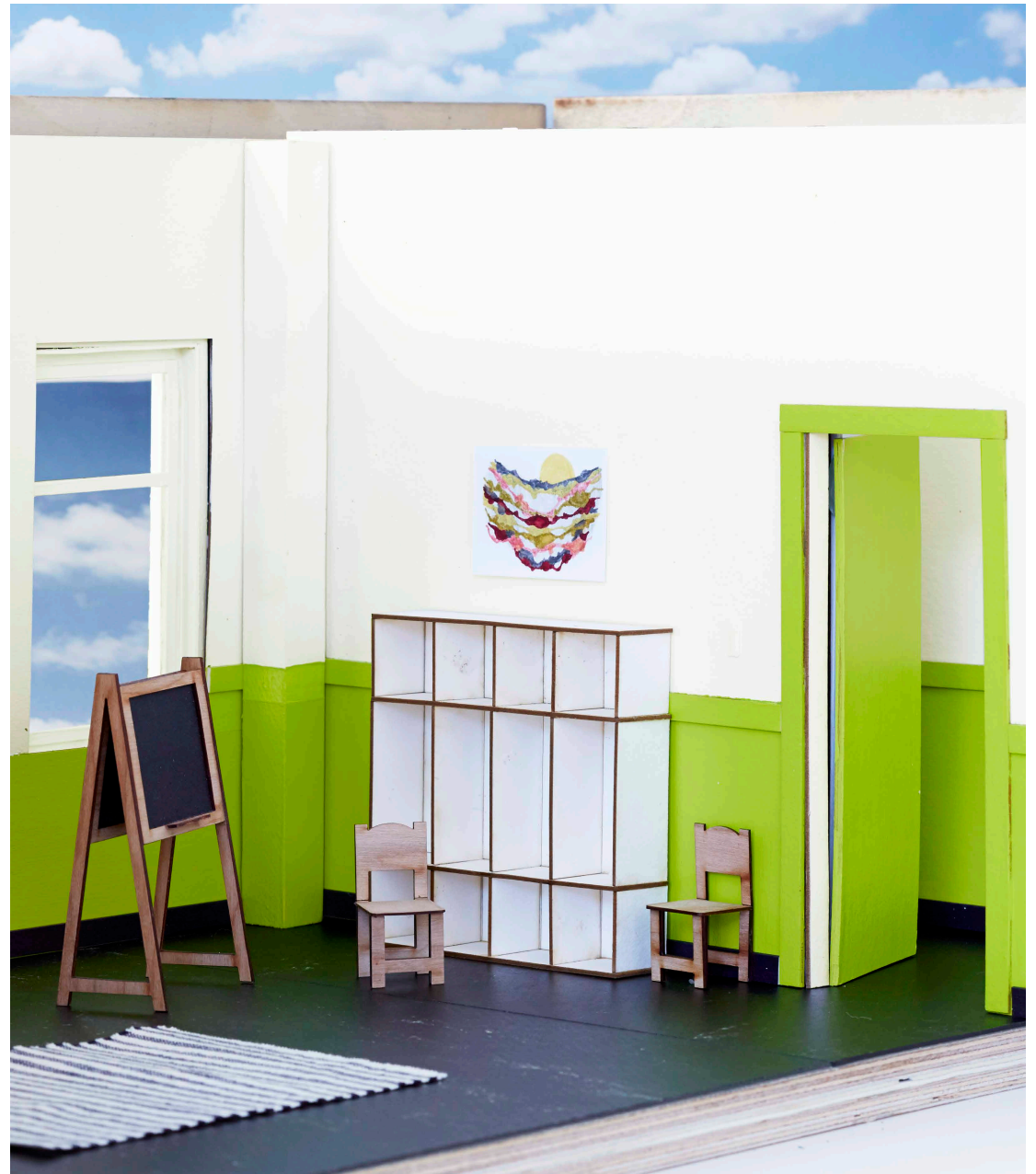
CO-229
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CO-212-2
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

Baseboard: XDO-384
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

WO-45
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

Daycare Colors: Parakeet





Center Stage 6920
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

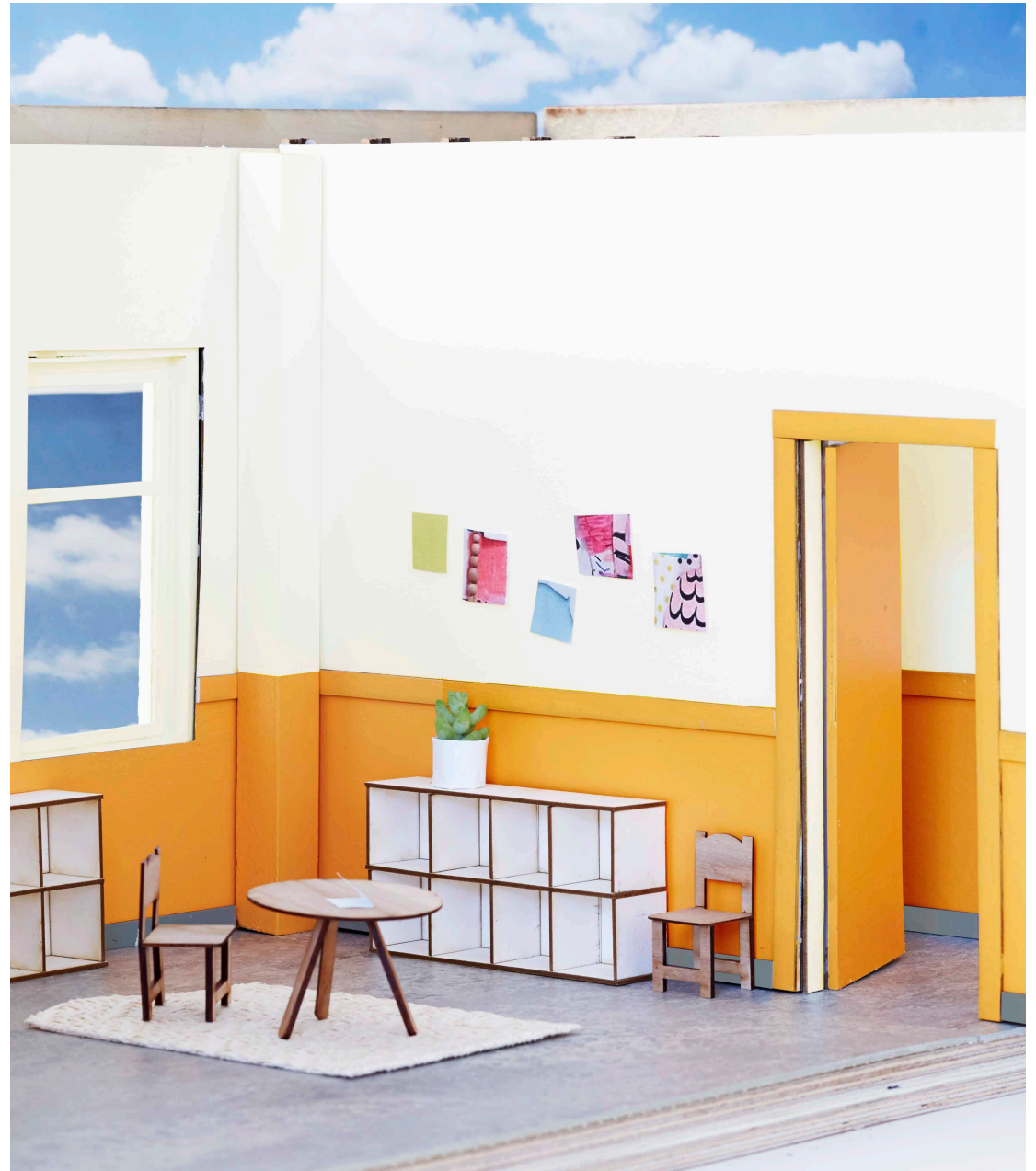
Lemon Twist 6909
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Mariner 6766
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Basebaord: Domino 6989
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Snowbound 7004
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Daycare Colors: Sea Anemone





Vegan 6738
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Osage Orange 6890
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Tame Teal 6757
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Baseboard: Serious Gray 6256
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Snowbound 7004
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Residential Color Palette: **Desert**





Thunderbird 675
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

Polar Ice 1660
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

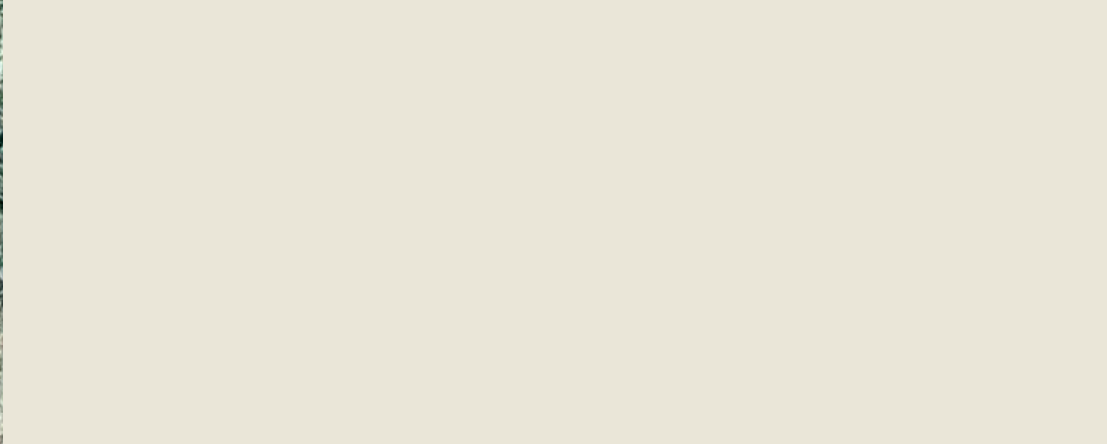
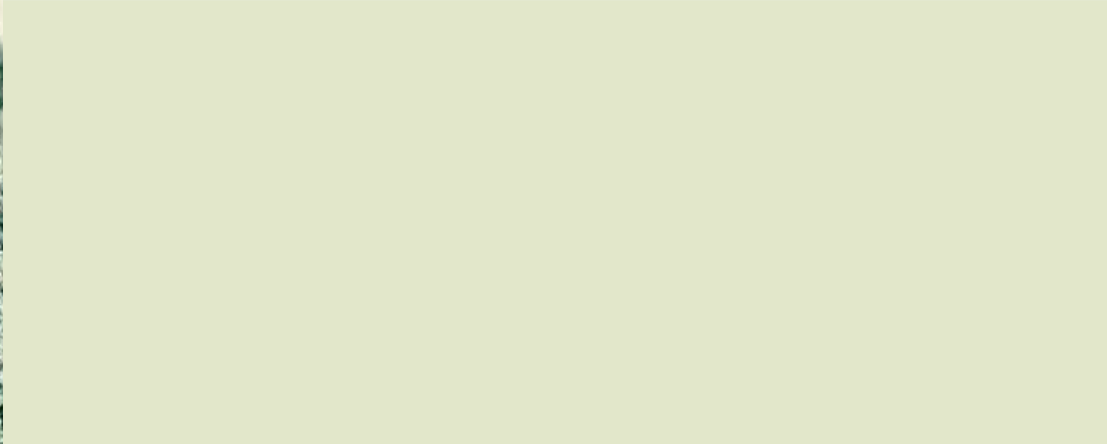
Linen White PM-28
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

Ice Formations 973
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

Decorator's White PM-3
Benjamin Moore | Aura Waterborne interior paint | eggshell finish

Residential Color Palette: **Grassland**





CO-225
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

CO-212-2
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

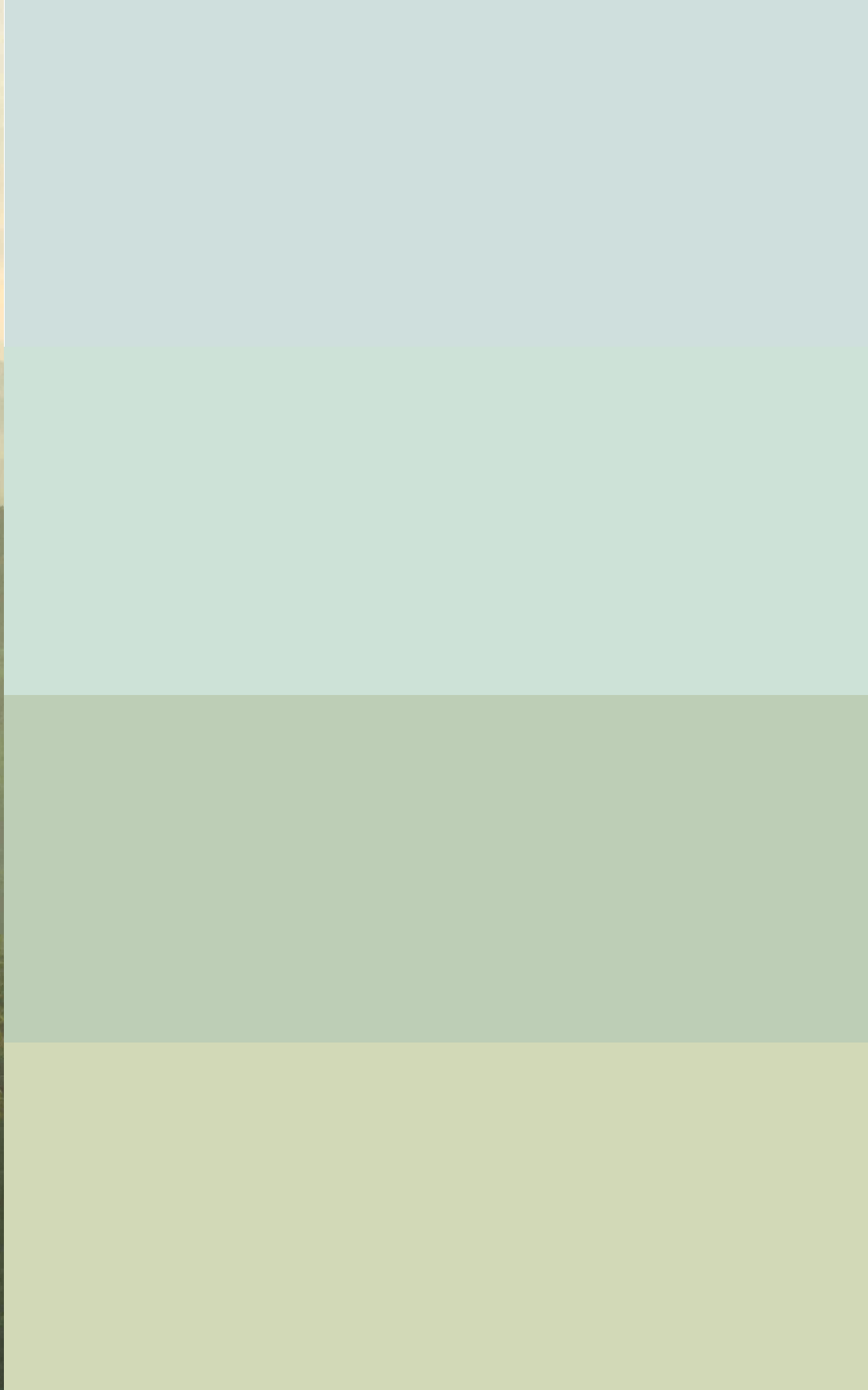
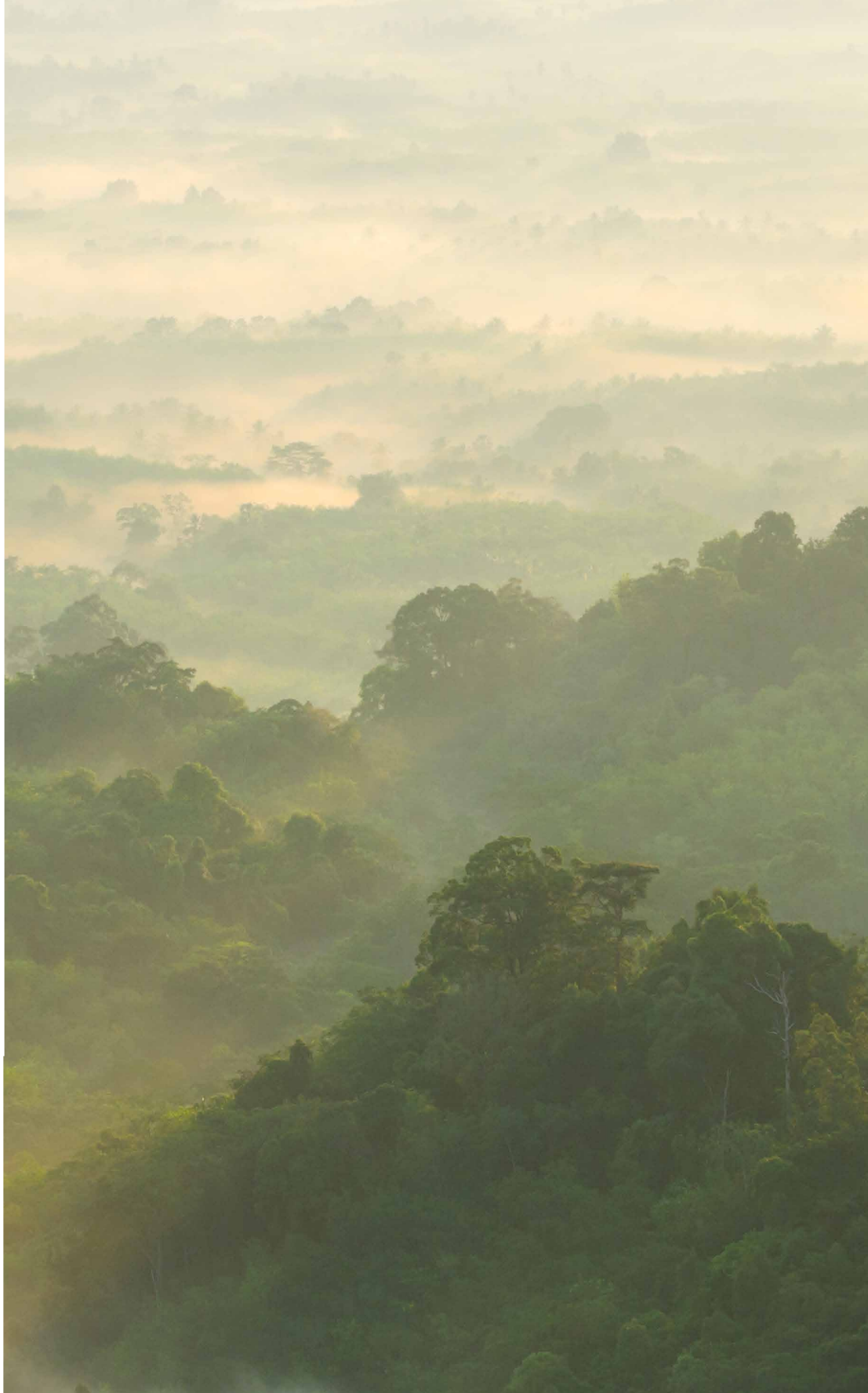
CO-277
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WO-99
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

WO-101
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

Residential Color Palette: **Rain Forest**





CO-233
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

CO-253
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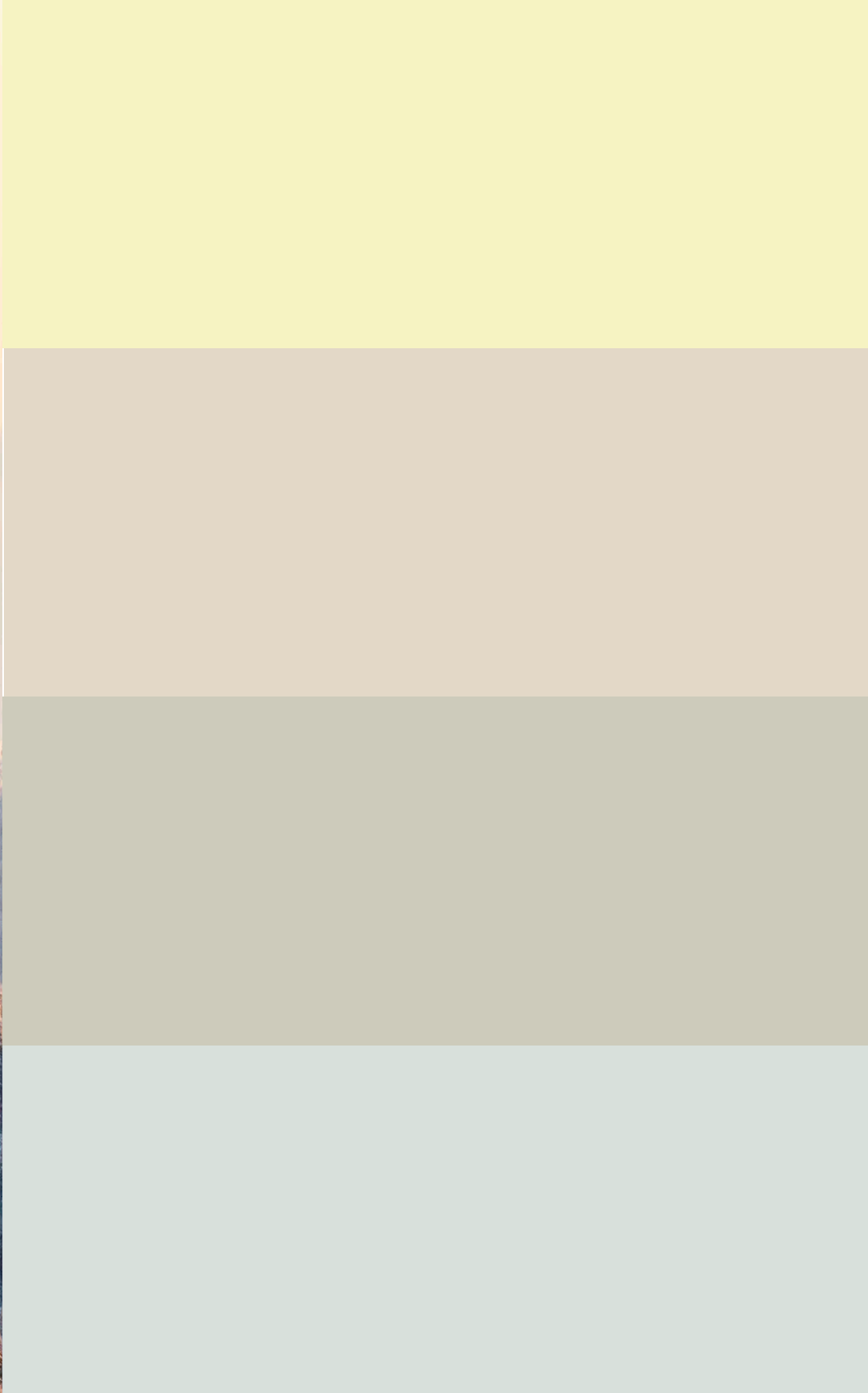
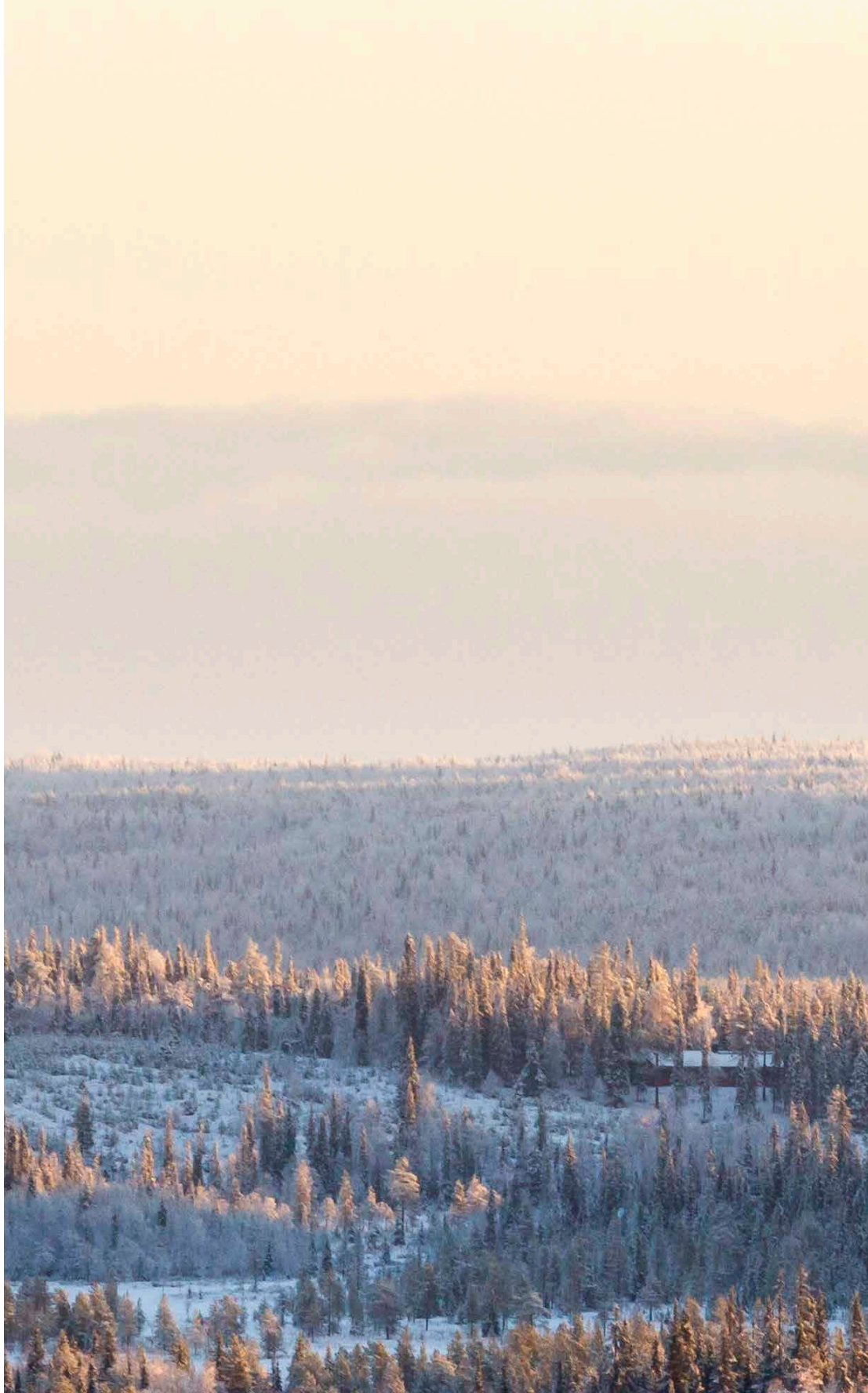
CO-267
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

CO-273
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

WO-27
ROMABIO | EcoDomus interior/exterior mineral paint | eggshell finish

Residential Color Palette: **Tundra**





Pineapple Cream 1668
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Individual White 6008
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Repose Gray 7015
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Mild Blue 6533
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish

Snowbound 7004
Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish



Sour Apple 401

Benjamin Moore | Aura Waterborne interior paint | eggshell finish
Barn Swallow Color Palette

Vegan 6738

Sherwin Williams | ProMar 200 Zero VOC interior latex | eggshell finish
Sea Anemone Color Palette

