

REHOME™

Restoring Homes to Optimize Military Excellence

a five year plan to modernize military housing

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Summary & Introduction

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Summary

Military housing is no longer technically acceptable for a 21st century United States military. The condition of existing housing and the design of new housing does not support stated objectives for readiness, retention, and family health. By building new housing and retrofitting existing housing to a technically acceptable, health based standard and implementing an accompanying healthy home culture, these objectives can be achieved. Not only can this be done cost-effectively, the military will also have turned housing into a strategic advantage that can enhance both cognitive capacities as well as the training, deployment, and recovery cycle. This transformation can effectively be completed within 5 years.

The magnitude of modernizing 200,000 military homes affords leadership a rare opportunity to disrupt the history of housing problems and re-engineer the function of housing to protect the health of our service members and create a cognitive advantage for the force. Historically, the evolution of building practices in America has been painfully slow as builders are cautious to change their methods. Implementing the technical requirements and systems necessary to achieve healthy military homes will require a comprehensive plan to effectively disrupt the inertia of traditional building knowledge and implement the known best practices of healthy home construction.

The REHOME plan outlines the necessary steps:

- Personnel Structure Capable of Implementing the Shift
- Strategic Assessment Using an Algorithmic Diagnostic
- Three Levels of Healthy Home Upgrades
- A Compliance Process
- A Healthy Home Culture

The incremental steps required to upgrade existing homes or make a code-built home perform as a healthy home system are not extensive. They have been refined by clusters of builders and manufactures around the US for over 30 years. Because the best-practices are already well established at scale, they are “Commercial Off-The-Shelf” available for the PPV’s to begin modernizing military housing now. Technically acceptable homes are designed and built, or retrofit to these principles: 1) Continuous, Balanced Mechanical Ventilation, 2) Properly Sealed and Insulated, 3) Less Toxic Materials and Cleanable Surfaces.

Modernized housing paired with the implementation of a culture of healthy home habits will achieve the objectives for readiness, retention and family health. These initiatives together will enhance the capability of housing to enhance the cognitive capacities of the force as well as the training, deployment, and recovery cycle. Additionally, this plan provides significant long-term health savings, energy savings, job creation, carbon reduction (as well as reduced maintenance and increased housing resiliency). Decisive action will spawn a new age of military housing for the 21st century.

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Introduction

The recognition that military housing is significantly impacting readiness, retention and family health has created an immediate need to modernize housing. We now see that housing is no longer technically acceptable to meet the needs of the 21st century military. Today, housing industry studies and medical studies demonstrate that housing can have significant effects on health, morale, recovery, learning and cognition. The urgency is demonstrated by the serious attention military command has placed on solving the housing crisis.

The REHOME plan marshals well established principles of how to build and retrofit homes as a system that optimizes health and cognition by drawing on “Commercial Off-The-Shelf” (COTS) equipment, materials, best practices and diagnostics. Best estimates indicate that 5-7% of military families are severely impacted by their home, are seeing multiple medical specialists and are incurring high medical expenses. Another 12-20% of military families are moderately impacted by their home, seeing multiple specialists and incurring moderate medical expenses. For the remainder, housing conditions are generally not enhancing readiness, retention, family health, cognitive capacity or the training, deployment and recovery cycle.

In simple terms a technically acceptable home is retrofit or built to work as a system that supports health. It is built tighter to protect against outdoor pollutant infiltration. It utilizes balanced, filtered, mechanical ventilation to improve health and cognitive capacity and to manage internal moisture accumulation. It minimizes toxic exposures from building materials, has cleanable surfaces and is maintained with health as the priority. Occupants experience a home that is peacefully quiet, nearly dust free, has fewer pests and an absence of unpleasant house odors. From a satisfaction perspective, these benefits are highly valued by the occupants over other traditional housing attributes.

For the most impacted, regaining their full health is only possible by moving affected families into healthy homes. The longer they remain in an impactful home, the longer and more difficult the road to full recovery. This plan focuses the initial effort on immediately moving the 5-7% of severely impacted families into homes retrofit or built to the Level 3 Health Home+, also called Recovery Housing to be completed in less than 16 months. Equally important is transitioning the 12-20% of moderately impacted families into homes retrofit or built to a Level 2 Healthy Home within the first 24 months. Because this second group is less impacted, experience demonstrates they are more likely to return to full readiness faster. The remainder of the housing will be transitioned during the standard PCS process over the life of the plan.

We now understand that nearly one-third of how homes impact health is a result of occupant behavior. Implementing a culture of healthy home habits will immediately start to reduce the overall impacts from housing while the five-year plan is being implemented, and it will enhance outcomes in the retrofit housing. Providing actionable steps to families in homes that improve their situation further demonstrates leadership’s commitment towards the journey to healthy homes.

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Introduction (*continued*)

The Cost-of-Inaction (COI) is high. Beyond readiness and the demoralizing impacts on family health, the long-term health care burdens are high. Solving the housing crisis is a significant step to manage the rising cost of health care. New housing is being designed and built with the same technical inadequacies that are known to impact readiness. Long term maintenance and energy costs are escalating, and the asset value of housing is degrading. Litigation is mounting and 25 years of history demonstrates that when the path to litigation is not disrupted by leadership the costs to fix the problem will multiply by 6x. If traditional building methods continue to be used to “solve” the problem the financial multiplier will increase to 9x the cost of the REHOME plan. That is an unnecessary burden for the US taxpayer.

This plan lays out the process of modernizing military housing within 5 years. It provides a method to evaluate all 200,000 homes and prioritize a plan. It spotlights the COTS equipment, materials, diagnostics, standards and best practices available today to effectively begin implementation immediately. It also provides a path to break through the industry inertia that has burdened the evolution of housing for decades.

When we shift our thinking and expect houses to be technically acceptable, housing itself can be transformed to become an integral element of the Personal Protective Equipment (PPE). This plan recognizes that the home is becoming the first line of defense for military family wellness in the 21st century. The indoor environment is now as essential as nutrition and fitness. Housing will become a strategic advantage for the new cognitive age of military operations and a component of an optimized Joint Force.

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The Strategic Approach

The Plan

Success relies on rapidly shifting traditional building and maintenance practices in military housing and implementing the system of incremental changes necessary to transform housing to be technically acceptable to achieve the readiness, retention and family health objectives. These changes include building a culture of healthy home habits that enable military to optimize the health, wellness, recovery and cognitive impacts that come from healthy homes.

Technically acceptable homes are designed, built, or retrofit to these principles:

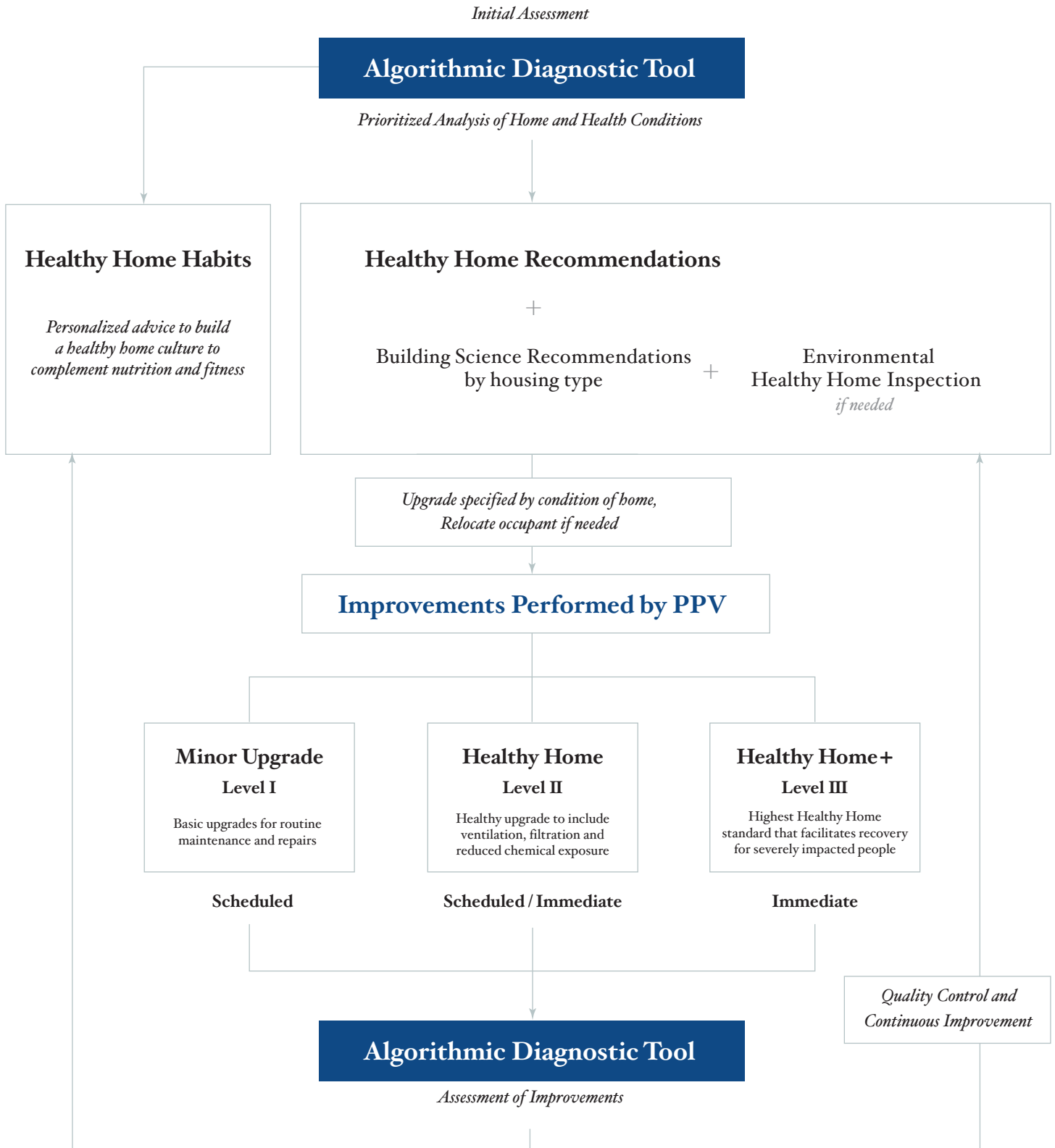
- Continuous, Balanced Mechanical Ventilation
- Properly Sealed and Insulated
- Less Toxic Materials
- Cleanable Surfaces.

The application of the principles varies by climate and proximity to outdoor pollution as well as age and type of house. Their performance is measured with mechanical tools during construction and by occupant experience over time.

To ensure decisive implementation a Leadership Council will be created to mine the existing best practices necessary to achieve the objective. It will direct:

1. Implementation of an Algorithmic Diagnostic Tool (ADT) to rapidly evaluate all 200,000 homes.
2. Establish a Management & Oversight Authority to manage the process and provide accountability.
3. Hiring Building Scientists who can physically evaluate performance of each housing type on each base.
4. Creation of an Education & Integration Team to train the PPV's, contractors, design professionals, local code officials, maintenance teams and military personal to implement and maintain this modernized, technically acceptable standard.
5. Development of a cadre of Independent Compliance Inspectors necessary ensure consistent implementation across all states.
6. The creation of a Continuous Improvement Council to review success and refine the process. Modernizing 200,000 homes provides the economy of scale necessary to drive down the cost of implementation while improving the methods and technology.
7. Development of a Culture of Healthy Home Habits to begin reducing health impacts now and optimize the benefits of the upgraded housing after completion.

The Plan Process



The Plan Process Detailed

Algorithmic Diagnostic Tool

Prioritized Analysis of Home & Health Conditions

A strategically implemented process begins with the Algorithmic Diagnostic Tool (ADT). Historically to effectively analyze the risk housing poses to readiness, retention and family health hundreds of appropriately trained, credentialed and experienced experts would need to physically inspect all 200,000 homes. This would often require multiple visits, detailed occupant interview and widespread use of environmental testing. It is very time consuming, expensive and there is a limited group of qualified people available to perform the work.

Using a modern Algorithmic Diagnostic Tool (ADT) to analyze housing types, climate zones, internal and external conditions, and the impact of occupant interactions, a strategic approach can now be applied that guides an infinitely more cost-effective use of resources. Military families know their homes. Their personal experience of their home is rich with the information necessary to analyze impacts on readiness, retention and family health, as well as structural condition and long-term maintenance needs. An Algorithmic Diagnostic Tool designed to calibrate this self-reported occupant experience can rapidly crowd-source this information across all 200,000 homes in just 20 minutes per household.

Deep analytics from the crowd-sourced data base allow rapid identification of the most impacted occupants and the homes in the worst condition. It enables the strategic application of resources to start rehabilitating and modernizing where there is the greatest impact on readiness and family health. It filters and focuses the use of onsite inspections and creates a scope of work by house, that when combined with the Building Science Recommendation by housing type, together constitute the scope of work necessary to bring each house up to the new, technically acceptable standard. Where unique situations exist recommendations from a certified, Environmental Healthy Home Inspector would be added.

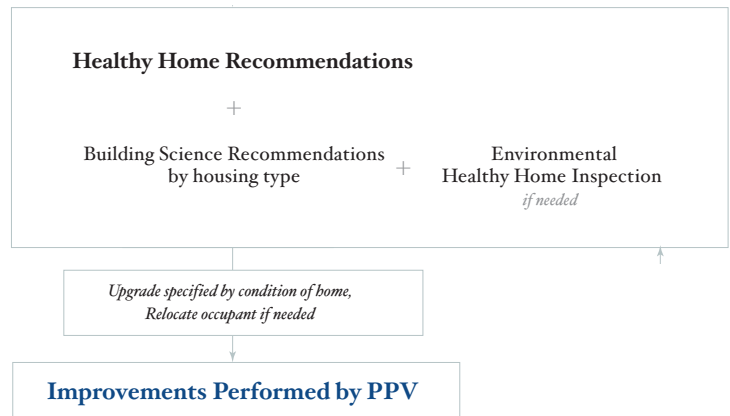
Initial Assessment

Algorithmic Diagnostic Tool

Prioritized Analysis of Home and Health Conditions

Building Science Recommendations

Each base has a mixture of housing types with different vintages. Because buildings comply with the laws of physics, each housing type will have a common set of flaws that cause failure, structural degradation and health impacts. Building scientists will go to each base and housing type to document the common failures. They will create Building Science Recommendations by housing type to ensure that when buildings are retrofit these problems are fixed while the upgrade is being implemented. Economy of scale is achieved because each housing type has been replicated across hundreds of homes diffusing the expense. They will also examine new housing plans and propose climate specific modifications. This effort will create a tremendous reduction in future maintenance costs and help preserve the asset value of housing over the life of the leases.



Environmental Healthy Home Inspections

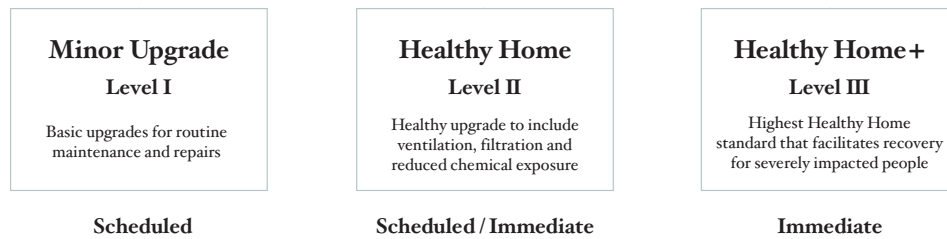
Where unique conditions exist that have been identified by the Algorithmic Diagnostic Tool, the Building Science Teams, occupants, command, the PPV, or a certified Environmental Healthy Home Inspectors will be used to develop appropriate solutions. (Unique conditions are situations such as proximity to an unusual source of pollution, like a burn pit, plume or pesticide, a failure not common to the housing type and vintage, a particular chemical used in the construction in a group of housing that is created by a pattern of health effects, etc.) Additionally, they will be used to audit each class of intervention to ensure the overall process is effective to verify remediation work.

Improvements Performed by the PPV

Initial risk evaluation and healthy home upgrade scope of work will be provided for each home by the ADT. This will be combined with the Building Science Recommendations and PPV Maintenance Plan (which includes occupant maintenance requests) to provide the full scope of work. Where unique situations exist recommendations from the certified Environmental Healthy Home Inspections will be added.

Three Levels of Healthy Home Upgrades

At this stage of research, our estimate of which kinds of upgrades need to be applied to the 200,000 privately owned military homes is as follows:



Level 3 Healthy Home+

Highly Urgent - 5.5% of the most impacted families need to be quickly moved from their existing home into a Level 3 Healthy Home+ to facilitate their recovery. That is approximately 11,000 homes to be upgraded in the next 12-16 months. Level Three differs from Level 2 in that it has a greater ventilation rate, higher level of filtering and greater attention to the toxic exposure. Families impacted at this level need to be moved from their existing homes and their personal contents need to be replaced.

Level 2 Healthy Home

Urgent - Approximately 12-19% of homes are having significant impact on families. These need to be quickly upgraded to avoid additional impacts on readiness and increase likelihood of full recovery. This represents 24,000 to 38,000 homes over the first 24 months that need to be upgraded so affected families can move into them.

Level 2 Upgrade During PCS Cycle

Approximately 52-59% of housing needs to be upgraded to a Level 2 Healthy Home during the 2-week vacancy cycle during the PCS process. Using the Algorithmic Diagnostic Tool some homes would receive a full upgrade to Level 2 on the first PCS cycle (every 24 months on average).

Level 1 Minor Upgrade

Less urgent homes would receive a Level 1 Minor Upgrade and await a full upgrade on the second PCS cycle.

Level 2 Upgrade for Replacement Homes

Approximate 23% of existing housing is slated to be torn down and replaced. New homes would be upgraded to Level 2 Healthy Home and would need to demonstrate that the assemblies are appropriate for the climate in which they are being built. (Note - Some of the housing slated for demolition could be saved and upgraded to Level 2)

Level 2 Healthy Home Upgrades for New Military Housing

Urgent - Designs must be immediately upgraded to achieve a Level 2 Healthy Home and demonstrate that the assemblies are appropriate for the climate in which they will be built to avoid replicating today's housing failures.

Healthy Home Culture

Research and analysis by organizations around the country demonstrate that approximately one third of health impacts from housing are a result of occupant habits. By building a culture of healthy home habits occupant health and military readiness can be improved by significant levels. Research also demonstrates that when occupants are educated about Healthy Home Habits and empowered with knowledge about basic steps they can take themselves to improve their families health they become very motivated to act. These actions are shown to lead to reductions in symptoms and improved wellness. Implementing a healthy home culture immediately begins the journey to improved readiness, retention and family health while the housing stock is being modernized.

An Algorithmic Diagnostic Tool (ADT) gathers from the occupant data about the physical condition of the house as well as an assessment of their healthy home habits. It assesses the impact of those habits on the house as a system and how that system affects occupant health. It is then able to personalize advice on which habits are most impactful and what new habits to adopt. These recommendations are provided via smart phone and email on a routine basis to help motivate occupants to adopt healthy home habits. Occupants report back the changes they make along with the impact on their health symptoms which creates analytics for continuous improvement and tracking.

Algorithmic Diagnostic Tool

Assessment of Improvements & Culture

Additionally, an ADT is needed to provide independent assessment of the healthy home upgrades and designs by measuring the impact on health through the occupant's self-reported observations. This data will inform the Continuous Improvement Council in their efforts to enhance effectiveness and achieve economies of scale. It will also help fine tune the process of building an accompanying culture of Healthy Home Habits.

Healthy Home Habits

*Personalized advice to build
a healthy home culture to
complement nutrition and fitness*

Algorithmic Diagnostic Tool

Assessment of Improvements

Personnel Structures

This structure moves the existing construction methods and failing military housing stock to the next level of readiness by implementing Commercial Off-the-Shelf materials, equipment, diagnostics, and best practices currently used by the most advanced builders. It is intended to provide the highest level of guidance and oversight for a successful transition into a Healthy Homes Culture.



Guidance & Accountability

A council of nine to guide the process, three from the military (Army, Navy, and Air Force) two from the PPV's, and three building professionals and one chairperson. They will oversee the Management Group and Continuous Improvement Council.



Implementation & Logistics

Full-time staff dedicated to implementing the plan process. Responsible for managing and insuring accountability from the Education & Integration Team, the PPVs and the Independent Compliance Inspectors.



Role

Train inspectors, and contractors on best practices for upgrading and maintaining homes.

Responsibilities

- Develop and implement training
- Teach principles and practices for healthy home upgrades
- Train housing office and code officials
- Integrate new learning from Continuous Improvement Council



Role

Refine and optimize the process of upgrades.

Responsibilities

- Evaluate Diagnostics
- Study process performance and costs
- Integrate national best practices
- Achieve economy of scale or economies of scale



Role

Regular inspection of healthy home upgrades and remediation. Confirms best practices are consistently applied.

Responsibilities

- Authority to red tag and stop work
- Report on compliance and progress for all contractors
- Does not replace building code inspectors
- Review progress daily
- Maintain Independence

Personnel Structures Detailed

Leadership Council

It would be comprised of 9 leaders made up of one from Army, one from Navy, one from Air Force, 2 leaders from the PPV's, 3 Building Science Leaders and a Chairman. This group would be selected immediately and tasked with jump-starting the implementation of technically acceptable standards. This will require identifying the COTS equipment, materials, diagnostics, standards and best practices for each climate zone, forming the Education & Integration Team, the Building Science Team, the Independent Compliance Inspectors and selecting the Continuous Improvement Council. They will need to select the ADT and initiate the implementation of a Healthy Home Culture amongst military families. Finally, they would need to create a Healthy Home maintenance strategy with the PPVs.

Management & Oversight Authority

The process will need a dedicated staff to manage the implementation, coordinate the efforts necessary to achieve the upgrades as well as appropriate maintenance. They will create accountability with the PPV to implement the scope of work necessary to upgrade homes. The Independent Compliance Inspectors and the Education & Integration Team will report to this authority. It will be responsible for implementing the recommendations of the Continuous Improvement Council.

Education & Integration Team

An Education & Integration Team will need to be created to train the PPV's, contractors, design professionals, local code officials, maintenance teams and military personal to implement and maintain this modernized, technically acceptable standard. They will also need to train the Independent Compliance Inspectors to insure consistent implementation on a house by house basis.

The goal is to train the incremental steps required to upgrade homes for health as well as understanding how to maintain homes to insure they remain healthy. This requires learning to think of a home as a system and learning the principles of healthy home construction. It will also require training on how to implement the specific Scope of Work produced by the Algorithmic Diagnostic Tool, Building Scientists and house specific recommendations that may come from the certified Environmental Healthy Home Recommendations.

Continuous Improvement Council

The Continuous Improvement Council to review success and refine the process. Modernizing 200,000 homes provides the economy of scale necessary to drive down the cost of implementation while improving the methods and technology. The Continuous Improvement Council will report directly to the Leadership Council. This should be a multidisciplinary group capable of thinking of the home as a system which includes the occupant. The goal is to leverage this opportunity to modernize 200,000 homes to optimize the process to:

- Enhance readiness, retention and family health
- Cultivate construction efficiencies that reduce the cost of implementation
- Identify successful innovation that improves the indoor environment to achieve the objective
- Identify failures and prevent repetition
- Document the success

They will look for continuous improvement in design, the construction process and the maintenance practice and measure the impact against the objective using direct observation and occupant experience. The evaluation of results will require members of military command, military medical, civilian medical, PPV's, building scientists and building efficiency experts. The Leadership Task Council will routinely improve the process based on their findings.

Independent Compliance Inspectors

The success of this effort also depends on the Independent Compliance Inspectors. Where construction quality always breaks down is in the field where the actual work is performed daily. The construction industry in general is plagued by quality control problems.

To ensure consistent application of the necessary principles and techniques, a team of Independent Compliance Inspectors will be created to inspect the daily progress of the upgrades. The success of the Compliance Inspectors depends on the authority they are provided. Granting them the authority to "Red Tag" the job if the process isn't being following gives them the leverage they need to guarantee that the work is done correctly. Adopting this disruptive leadership formula is critical to deliver on the objective of modernizing military housing to a technically acceptable standard

Once the Scope of Work is established between combination of the Healthy Home Upgrades, the Building Science Recommendations and the Environmental Healthy Home Recommendations, the principles can be digitized by the Education Team and then trained. Compliance Inspectors inspect the daily work at each house with a combination of site visits as well as daily photographs submitted by the tradespeople doing the work via smart phones.

Precedent – When authority to stop manufacturing lines was bravely moved into the hands of those on the line it revolutionized quality and efficiency. This same principle can successfully be applied to military housing.

The Shift

Recognition that military housing is no longer technically acceptable for a 21st century military is recognition that the military's requirements for housing go beyond sheltering service members from the elements. The impacts on readiness, retention and family health shift our thinking to understand that the home must also shelter us from the indoor environment.

In the 21st century, inside our poorly ventilated homes, military families' health is being impacted by outdoor pollutants that concentrate within. Our indoor air is now full of chemically laden building materials, personal care items, cleaning supplies, pesticides, cooking gases, air fresheners and chemicals stored in the garage to name a few. When excess moisture, leaks and dampness occur the problems accelerate as biological growth occurs. The combination weighs on the health of the occupants.

To succeed in protecting military families, the Leadership Council will have to disrupt the inertia of traditional building knowledge and shift to the known best practices of healthy home construction. Historically the evolution of building practices in America has been painfully slow as builders are cautious to change their historic methods. Further impeding evolution, building codes do not include the technically acceptable, incremental steps necessary to ensure homes are healthy. This oversight mistakenly leads builders to believe they are already doing enough by complying with code, and it lulls the public into a false sense of security.

To further complicate the situation codes vary by state and local area. Many states are still using the 2014 Building Code and few have fully implemented or enforced the 2019 Building Code. Codes often lag 10-20 years behind the available best practices, building science and medical research. To drive this shift to upgrade homes for health, the Leadership Council will need to adopt one standard that is technically acceptable for all military housing in all fifty states.

The incremental steps required to upgrade a code-built home to a healthy home or to retrofit existing homes are not extensive. Although the methods, ventilation equipment and systems thinking are not well understood by most builders and design professionals in the US, these methods, ventilation tools and systems have been refined by clusters of builders, at scale, around the US for over 30 years. Because the practices are well established at scale, they are available now to be quickly trained and implemented in a cost-effective manner by the PPV's and contractors needed to modernize military housing.

Although building science is a well-established field, many of the advancements have also flown under the radar of the traditional building establishment. To effectively modernize housing to be healthy, durable and energy efficient, this process will incorporate modern building science.

“The practical purpose of building science is to provide predictive capability to optimize the building performance and sustainability of new and existing buildings, understand or prevent building failures, and guide the design of new techniques and technologies”

There are several regional building science firms that can be contracted to go to each base to do this necessary work. They would also review new planned construction to minimize failures and ensure designs are appropriate for the climate in which they will be built. The Education & Integration Team would provide training to ensure that the Principles of Healthy Home are consistently applied by each firm hired.

In most cases there are existing training infrastructures across the United States who understand building science, homes as a system and these best practices. They can be contracted to implement the training. The Education & Integration Team would ensure these training groups understood the Healthy Home Principles and Scopes of Work developed so they could be integrated into their training programs and consistently delivered. These groups can also design digital training tools that tradespeople can access in the field on their phones to ensure the applications are done correctly. Training can be done both virtually and by bringing people to regional training centers as well as on base training.

Modernizing 200,000 homes across 300 bases will require training a significant number of people. In addition to training the existing PPV's, contractors, design professionals, local code officials, maintenance teams and military personal, many new trained positions will be created. We provide estimates in the Addendum.

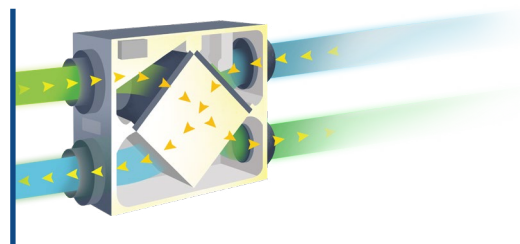
The people working in these clusters of builders and design professionals outlined in this plan already use and understand these best practices, technologies and materials. They have been diligently meeting for 10-20 years at conferences and in groups dedicated to advancing building practices. They are prepared and qualified to lead this shift. Until now, their work has been largely under the radar screen of the traditional building and design community who remain slow to evolve. Within these communities the Leadership Task Council will find most of what they need to modernize military housing.

This training effort has the potential to give birth to a whole new industry of healthy home builders and designers which will ultimately benefit the wellness of the entire country and reduce our national health care burden. Many retiring veterans could qualify for these jobs and be trained by DoD Skillbridge. The nation has a significant shortage of trained construction workers which means that such a training effort would be of great benefit to the housing sector, one of the great economic engines of America.

Ventilation

One of many examples of best practices, technologies and materials that have been developed at scale and are now Commercial Off the Shelf ready for use.

Appropriate ventilation is the backbone of creating healthy indoor environments, yet 98% of homes today are built without it. In this light, fresh air ventilation becomes a 21st century innovation in housing. The industry has finally started to recognize the need for appropriate ventilation by including a basic requirement in the 2019 Building Code for the first time. Although a step in the right direction, it is not adequate to achieve a healthy indoor environment.



The technology required to properly ventilate a home is called Heat Recovery Ventilator. Depending on the specific climate and need an HRV or ERV is used. (Technically these are called Heat Recovery Ventilators or Enthalpy Recovery Ventilators). Homes are not typically built with modern, balanced, high efficiency ventilation systems using an HRV or ERV, yet the ventilation equipment is critical to managing moisture and filling a home full of healthy indoor air. However, in the state of Minnesota over 75% of the new homes have been built with this ventilation equipment installed in addition to the HVAC system. The Passive House community regularly uses this ventilation equipment in over 20,000 completed homes. So does Habitat For Humanity who builds extremely budget conscious homes. Additionally, they are quite common in Europe and Canada.

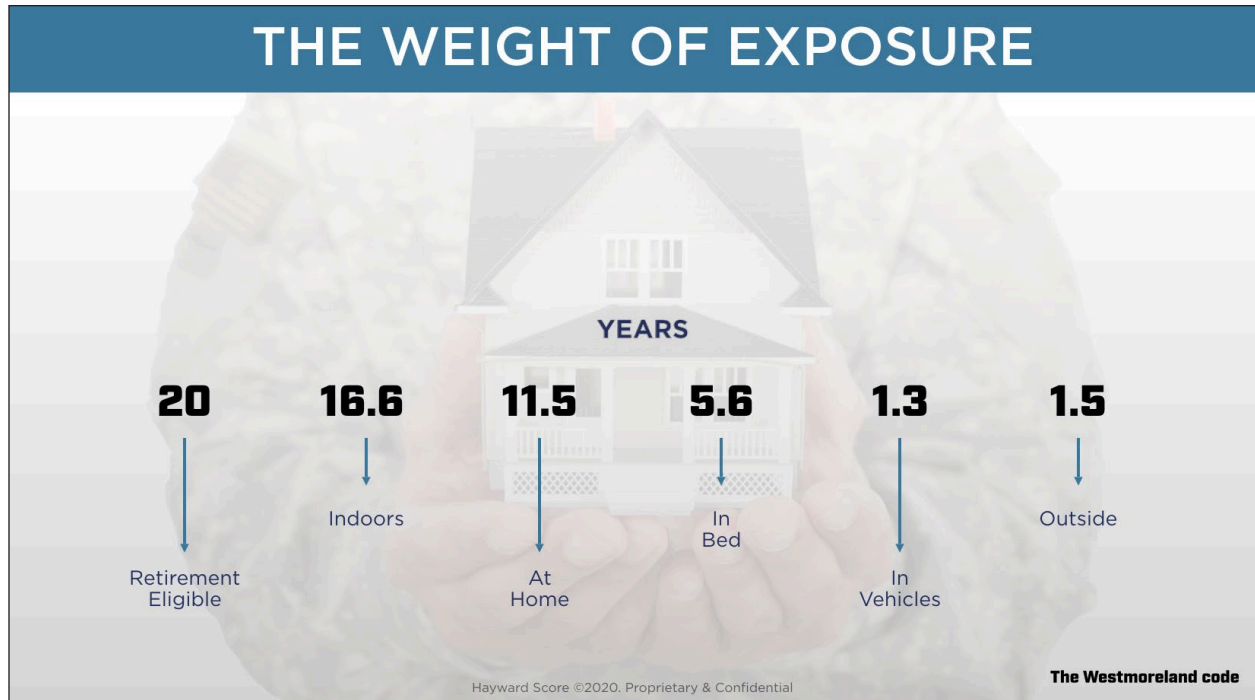
The Home as Part of PPE

With this shift in thinking we acknowledge that the home needs to serve a purpose beyond shelter to achieve the objectives for readiness, retention and family health. The home must now protect the joint force from the indoor and outdoor environment. It will become an integrated part of the service members Personal Protective Equipment (PPE) to protect the health and safety of the force.



The role of the home and its capacity to impact service members and their families is illustrated by the application of the Corsi Code, developed by the esteemed indoor air quality Professor Richard Corsi, to what we know about how service members spend their time. During a twenty year military career, the service member spends almost 60% of their time in their home. Taken together with the fact that Americans spend 90% of their time indoors, and a good portion of outdoor time in vehicles moving between indoor locations, military member and their families are an indoor generation.

The Weight of Exposure



The “weight of exposure” term is used to convey weight of exposure over time. Given the time we spend indoors the weight of low-level exposures becomes impactful over time.

Until now our focus has been to worry about exposures that happen outdoors. Not only do outdoor environmental pollutants seep in and get trapped due to lack of ventilation, but we have we have come to learn that our indoor environments are full of chemicals and biological activity. This situation is further exacerbated if there are a high level of outdoor pollutants sources like burn pits, air strips, and highways near the housing.

Since homes trap or contain environmental pollutants we have the opportunity to shift the paradigm by turn the container into protection. Upgrade military homes to shield and diminish the exposures military personnel face in a home by implementing this technically acceptable standard. Make the home part of the PPE. By recognizing the weight of exposure, we now understand the home to be the “First Line of Defense” for 21st Century Wellness.

Optimizing Cognitive Capacity & The Training, Deployment & Recovery Cycle

Protecting our service members and their families by optimizing the indoor environment has some very measurable outcomes for readiness. Harvard University at the T. H. Chan School has done some breakthrough work over the last 5 years on the impact of the indoor environment on public health. Long term research demonstrates that when indoor air quality is optimized, as compared to the average air quality Americans typically experience, cognition increased between 60-100%. Some studies found significantly higher improvements. They also found that people who worked in these “better air” environments saw a 12% improvement in productivity and slept measurably better at night. They also saw reduced sick days. Forward thinking corporations are adopting these “fresh air” strategies to optimize their workforces.

Optimized indoor environments will have a significant benefit to the training, deployment and recovery cycle beyond cognition, productivity and learning. If a house is weighing on the service members health, recovery is hampered. When the indoor environment is optimized it reduces this unnecessary weight and enhances recovery. Although more sleep may not be an option for service members, quality of sleep is vitally important. Without the unnecessary weight from indoor exposures, service members can become more resilient to the stressors they experience during deployment.

In the new cognitive age of the 21st Century the Navy notes it’s through “gray matter not gray hulls” that we will achieve strategic advantage. The decision to upgrade housing for health is a strategic imperative for military effectiveness as well as the right thing to do for the force.

Budget

Using available statistics, we have estimated the total cost to implement REHOME over 5 years. The plan delivers on the objectives of readiness, retention and family health as they relate to housing. It also provides new strategic capacities. By correlating our house data with insurance spend surveys to civilian and military families we are able to estimate the health care costs associated with health impacts from housing. We have also estimated the number jobs for trained healthy home tradespeople produced by the plan as well as the substantial energy savings. This is covered in the Addendum.

Note: In Canada and some European Countries where the government pays both the medical costs and writes the building codes, the codes were changed years ago because they understood the cost of housing on the health care system”

Conclusion

Heightened attention by spousal groups and Congress on military housing has highlighted years of neglect and poor conditions. The impacts on readiness, retention and family health are unacceptable. The effort by military leadership to quantify these failures demonstrates that military housing is no longer technically acceptable for a 21st century military. Beyond these afflictions, inaction, or continuing down the path of traditional thinking, will cost the taxpayer 9x more than the cost of implementing this strategic military upgrade.



The situation requires a shift in thinking to recognize that the modern home serves a purpose beyond shelter from the elements. It must also

shelter us from the indoor environment. By upgrading military housing for health, it becomes an integrated part of the PPE. This new, protective capability of housing can also enhance both the cognitive capacity of the force and the training, deployment recovery cycle. Implementing a Healthy Home Culture to accompany the current culture of nutrition and fitness completes this new capability and strengthens the force.

Implementing REHOME to upgrade military housing for health will resolve the housing crisis. Modernizing housing will improve readiness, retention and family health while building a strategic advantage for the new cognitive age. Additional benefits include significantly reducing both long and short-term health care costs, maintenance costs and asset value degradation of the government's military as well as major energy savings and create thousands of jobs for healthy home workers.

In the new cognitive age of the 21st century where the Navy notes it's through "gray matter not gray hulls" that we will achieve strategic advantage, the decision to upgrade housing for health is a strategic imperative for military effectiveness as well as the right thing to do for people who protect our country.