



# PHIUS 2021 MECHANICAL SUMMIT

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## Seven Steps for Effective Project Management



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# Seven Steps for Effective Project Management



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# Why are We Passive House practitioners?

I hate inefficiency

math is fun

seeing buildings come to life

I'm a nerd

SPREADSHEETS!

I like to get my hands dirty

I love the earth

engineering + science is fun

I LIKE BEING WARM

# Why are you a Passive House practitioner?

I LOVE TO ANTICIPATE + PLAN FOR RISK, CLASH WITH NAYSAYERS, PESTER TEAMMATES WHO MISS DEADLINES, HAVE TOUGH CONVERSATIONS, HAVE THE DISCIPLINE TO MONITOR WORKPLANS...??

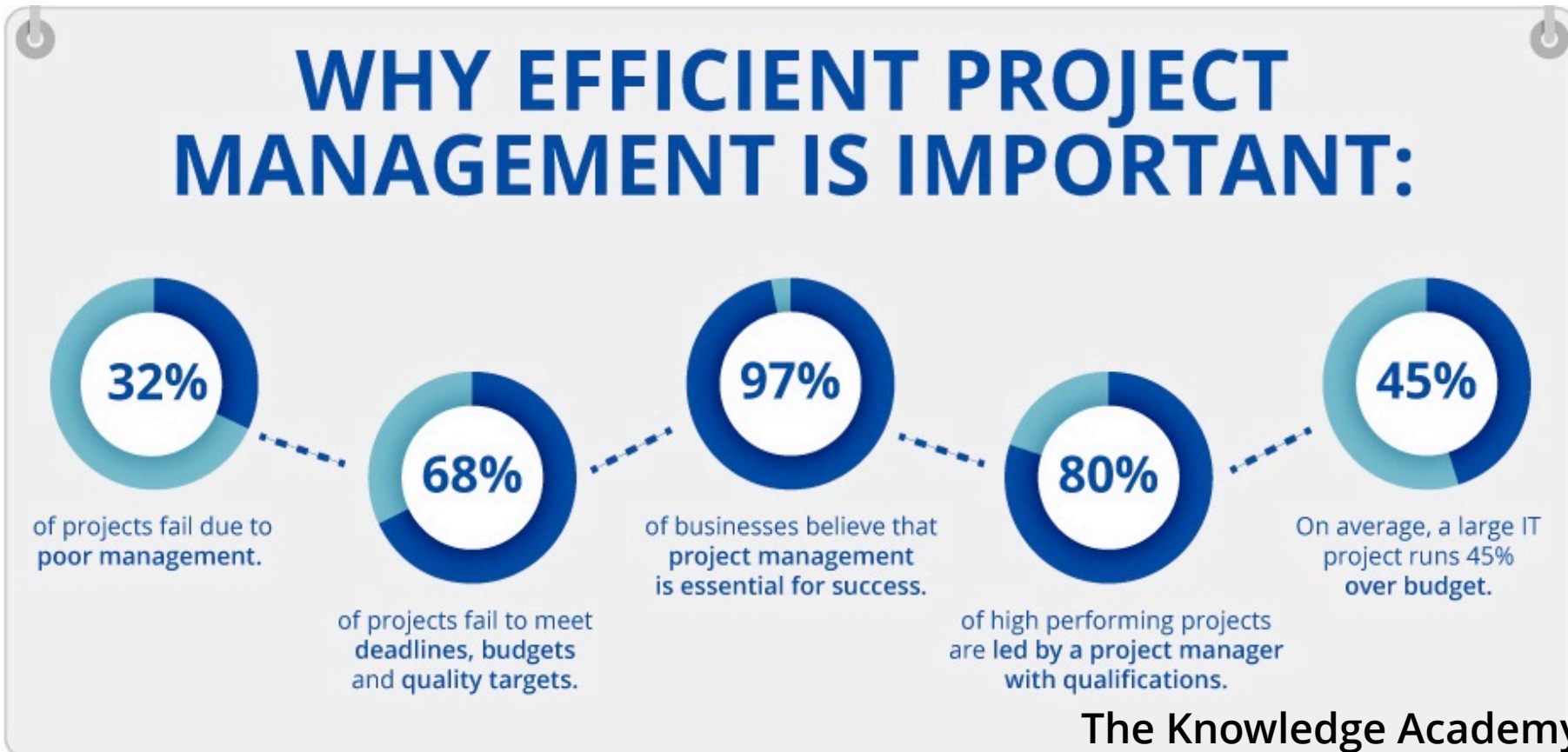
# What does Passive House take?

- Technical know-how
  - Building siting & massing, energy modeling, structural engineering, building assembly detailing, building science expertise, problem solving, mechanical design, construction process, commissioning...
- Who does this?
  - Architect, engineers, technical consultants, contractors, verifiers
- *How does it all come together?*



# What does Passive House take?

- **PROJECT MANAGEMENT!**
  - Technical challenges can be significant... but
  - *Planning and communication are equally as important and pose the biggest hurdles to success*



# The secret to project success:

- With unwavering commitment, a can-do attitude and disciplined approach to project management and team leadership, technical design and construction challenges for high performance buildings are

**NO SWEAT!**



Joan Benoit Samuelson - Tony Duffy / Getty Images

Kai Pfaffenbach / Reuters





# Project management is a MARATHON



Construction Project Management: Ar. Maribel C. Tubera

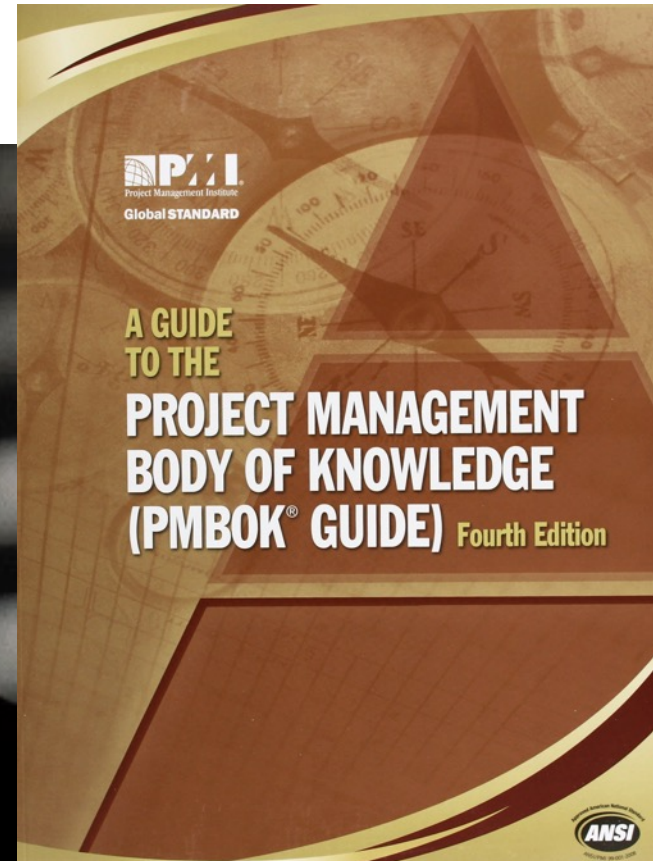
# Quiz

- Who's got a project management degree?
- Who's got a project management certification?



# History of project management

- Emerged as a distinct profession in the 1950's + 60's
- *A Guide to the Project Management Body of Knowledge* by PMI:
  - 1<sup>st</sup> edition written in 1996
  - 459 pages



# We are ALL “project” managers!

- ... within our respective roles on a project
- Key skills:
  - Planning
  - Organizing
  - Problem-solving
  - Never assuming
  - Asking questions (+ listening!)
  - Anticipating issues
  - Communicating effectively



- It's about PROCESS and INTERPERSONAL SKILLS
  - *Not technical knowledge or skills*

# Scrappy Project Management

## SCRAPPY PROJECT MANAGEMENT™

The 12 Predictable and Avoidable  
Pitfalls Every Project Faces



KIMBERLY WIEFLING

- Be completely & unrepentantly obsessed with the "CUSTOMER".
- Provide shared, measurable, challenging & achievable GOALS as clear as sunlight.
- Engage in effective, vociferous & unrelenting COMMUNICATION with all stakeholders.
- Ensure that ROLES & RESPONSIBILITIES are unmistakably understood and agreed upon by all.
- Create viable PLANS & SCHEDULES that enjoy the team's hearty commitment.
- Mitigate big, hairy, abominable RISKS & implement innovative ACCELERATORS.
- PRIORITIZE ruthlessly, choosing between heart, lungs & kidney if necessary.
- Anticipate and accommodate necessary & inevitable CHANGE.
- Challenge ASSUMPTIONS & BELIEFS, especially insidious self-imposed limitations.
- Manage the EXPECTATIONS of all stakeholders: under-promise & over-deliver.
- LEARN from experience. Make new and more exciting mistakes each time!
- ATTITUDE OF GRATITUDE. CELEBRATE project success....and some failures, too!

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# Beyond Efficiency's scrappy version:

- 1 Attitude + Commitment
- 2 Vision + Goals
- 3 Education
- 4 Collaboration + Communication
- 5 Roles + Responsibilities
- 6 Planning + Action
- 7 Monitoring + Feedback

= PROJECT SUCCESS



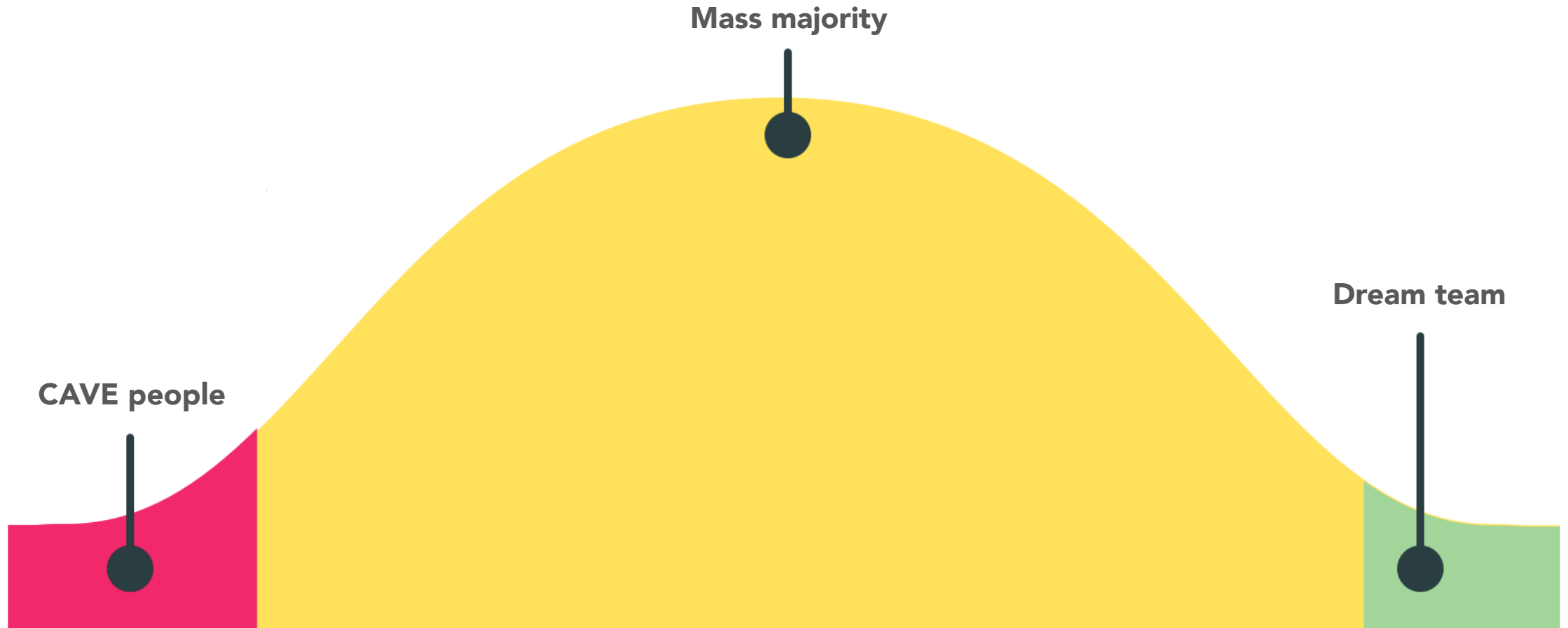
# 1. ATTITUDE + COMMITMENT

- Bring "can-do" attitude and unapologetic commitment to excellence!



# Create conditions for success:

## 1. Attitude + Commitment



*Build the right team for successful collaboration*



# CAVE people

- C itizens
- A gainst
- V irtually
- E verything
  
- ... what to do?
  - Be empathetic, walk in their shoes
  - Ask them questions
  - Have patience
  - Educate them
  - Respect THEIR knowledge and experience



Cave People by Brendan Corris

# Do what needs to be done...

- even when you don't feel like it.



# Anticipate + respond to CHANGE

- “It is not the strongest of the species that survives, or the most intelligent, but the one most responsive to change.” - Charles Darwin



# Be absolutely committed to EXCELLENCE

## 1. Attitude + Commitment



René Cazaneve Apartments, San Francisco, CA

# Be absolutely committed to EXCELLENCE

*Town of Jackson/Teton County: "Make these changes"*



# 2. VISION + GOALS

- Understand client's motivations and solidify project requirements

Distractions are things  
get rid of these, just  
ways carry a notebook  
be these things down im  
serves to **focus** my thoug  
spare moment and need  
do next. By keeping e  
any part of my brain  
out what I have to do

# Let's just get moving!

- **SCRAPPY TIP:** No sensible person would jump into a taxi and yell, "Drive like the wind, as fast as you can!"
  - Clarifying the destination is the first step in taking a trip [courtesy K. Wiefling]



# Owner's Project Requirements (OPR)

- Where are you going?

OWNER'S PROJECT REQUIREMENTS (OPR) SURVEY: SINGLE-FAMILY			
<b>Date:</b> 1/11/21			
<b>Purpose:</b> <i>The Owner's Project Requirements (OPR) document establishes the owner's expectations for the development regarding its sustainability, performance and operation. An effective OPR will clearly identify priorities, facilitate future decision making, and establish the direction of conceptual systems strategies. It should ensure a common understanding of not only WHERE the team is going, but WHY!</i>			
<b>Guide:</b> <i>At the outset of the project, ask owner or developer to complete or update as much information as currently known. Discuss responses in early-phase meeting, work through questions or conflicts, and finalize. Use this document to inform the Basis of Design (BOD) process for each design party (see next tab).</i>			
1	OVERVIEW	Owner	
1.01	Project history	What's the background and motivation for this project?	We are doing a renovation to our grand old Victorian home here in Rockridge (originally built in 1890). We would like to keep the bones and essence of the home intact while making it more liveable for our growing family.
1.02	Why Beyond Efficiency?	What did you hire Beyond Efficiency for this project? What value can we bring?	One of our top objectives is to drastically reduce (but not eliminate) our carbon footprint while maintaining a pragmatism in the MEP systems such that they are simple enough to service when something inevitably goes wrong. We intend to improve the thermal (and sound) insulation throughout (envelope, attic, walls, floors, windows), update to air source heat pump-based HVAC and DHW (leaning toward two separate systems), supply much of the annual electricity with rooftop solar PV + battery storage (and, if possible, "load shift" scheduled hot water tank thermal storage), and supplement the remainder with EBCE's 100% green rate plan.
1.03	Success	Looking back on the project, what will have made it a success?	Significant reduction in grid electricity draw despite the additional sq-footage. A more thermally comfortable home. Straightforward maintenance and service when something goes wrong.

Excerpt from Beyond Efficiency's OPR for a single family renovation project



# Owner's Project Requirements (OPR)

- Use answers to inform specific, actionable performance goals

Lighting	At interiors, fixtures/lamps with uniform electric lighting color temperature (TBD; 3000-3500 degrees Kelvin anticipated) provided to ensure consistent experience throughout building and simplify purchasing and maintenance.
Lighting	Minimum lighting color rendering index (CRI) levels specified as follows to ensure satisfactory experience: CRI 80 unless otherwise noted; lobby, dining and bistro: CRI 90.

## HVAC

Mechanical	Continuous filtered outdoor supply air from mechanical ventilation system (paired with air tightness strategies for enclosure) provides acceptable air quality during wildfires or other conditions with poor outdoor air quality.
Mechanical	Demand control ventilation provided for spaces with high variations in occupancy load.
Mechanical	Mechanical air conditioning required since passive strategies cannot ensure thermal comfort in this building type and climate.
Mechanical	Ductless heat pump systems with ceiling cassettes integrated where practical to minimize ductwork and dropped ceilings.
Mechanical	Residents have independent control of heating and cooling setpoints in their apartments.
Controls	Building management system (BMS) allows facility staff to program and monitor mechanical systems in common and convocation areas according to daily schedules or other custom requirements.

## PLUMBING

Plumbing	Hot water recirculation loop designed to integrate demand controlled pump as defined by energy code and ensure short wait times for hot water, minimal water waste, and minimized energy use.
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*Excerpt from Beyond Efficiency's OPR for a new mixed-use affordable senior project*

# 3. EDUCATION

- Establish common knowledgebase and inspire passion



# Rally the troops!

- Establish minimum baseline understanding of key principles
- Get the team excited & inspired
- Establish rapport



# Intensive “training/workshop” to kick off

- Tailored to stakeholders and project complexity

Item/ Scope of Work
<p><b>1. Workshop</b></p> <p><b>Desired outcome:</b> Completed matrix of ideal and alternate approaches for 1) foundation, 2) walls, 3) windows, 4) roof, 5) HVAC, and 6) DHW - concepts, products and materials</p> <p><b>Agenda:</b></p> <ul style="list-style-type: none"> <li>• <b>Part I training</b> (~1hr discussion/Q&amp;A): present best practices + examples from small-home case studies regarding building massing, space programming + window optimization for material, labor + energy efficiency; building envelope detailing and options; and all-electric options (including cold climate considerations) for HVAC + plumbing systems</li> <li>• <b>Part II workshop</b> (~2hrs team brainstorm, sketching etc.): discuss presented options and recommendations; develop matrix</li> <li>• <b>Follow up:</b> collate technical references/resources relevant to project approaches</li> </ul>

*Excerpt from Beyond Efficiency workplan for team workshop*

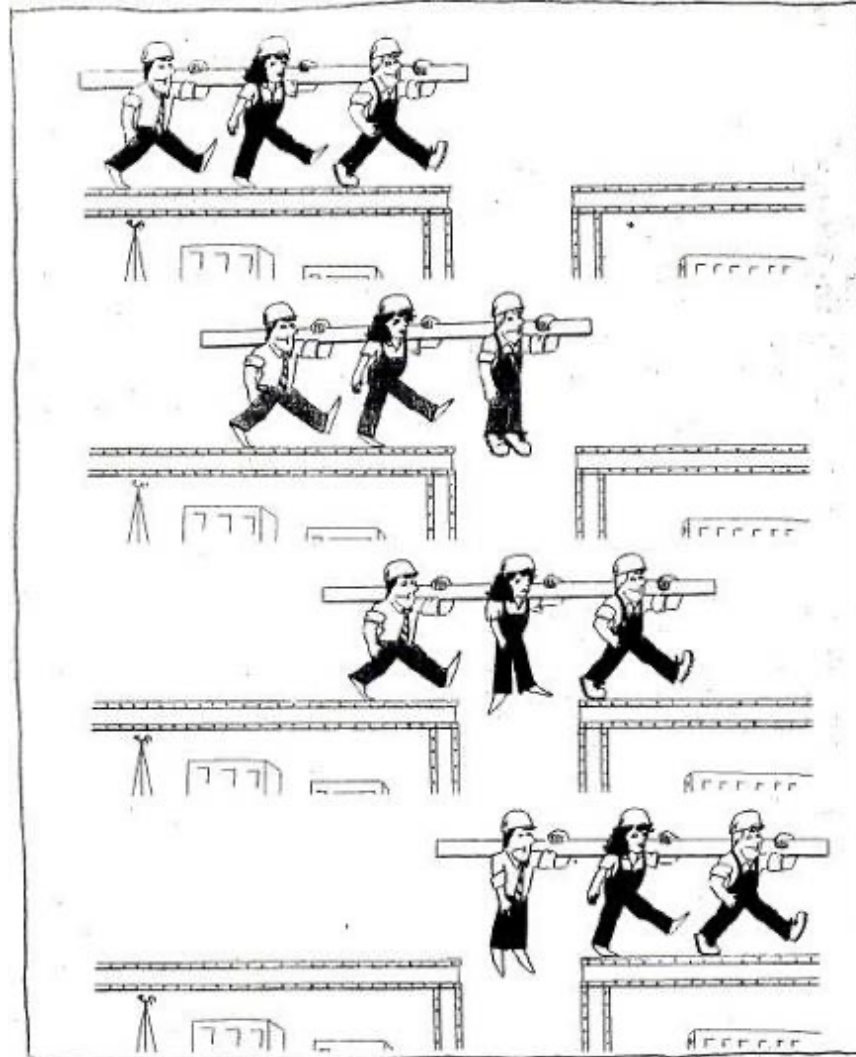
# Nurture a culture of knowledge

- Don't just say what should be done; explain WHY
- Use opportunities to empower others with insight and understanding
- Set up the GC and subcontractors for success (mockups, preinstallation meetings)



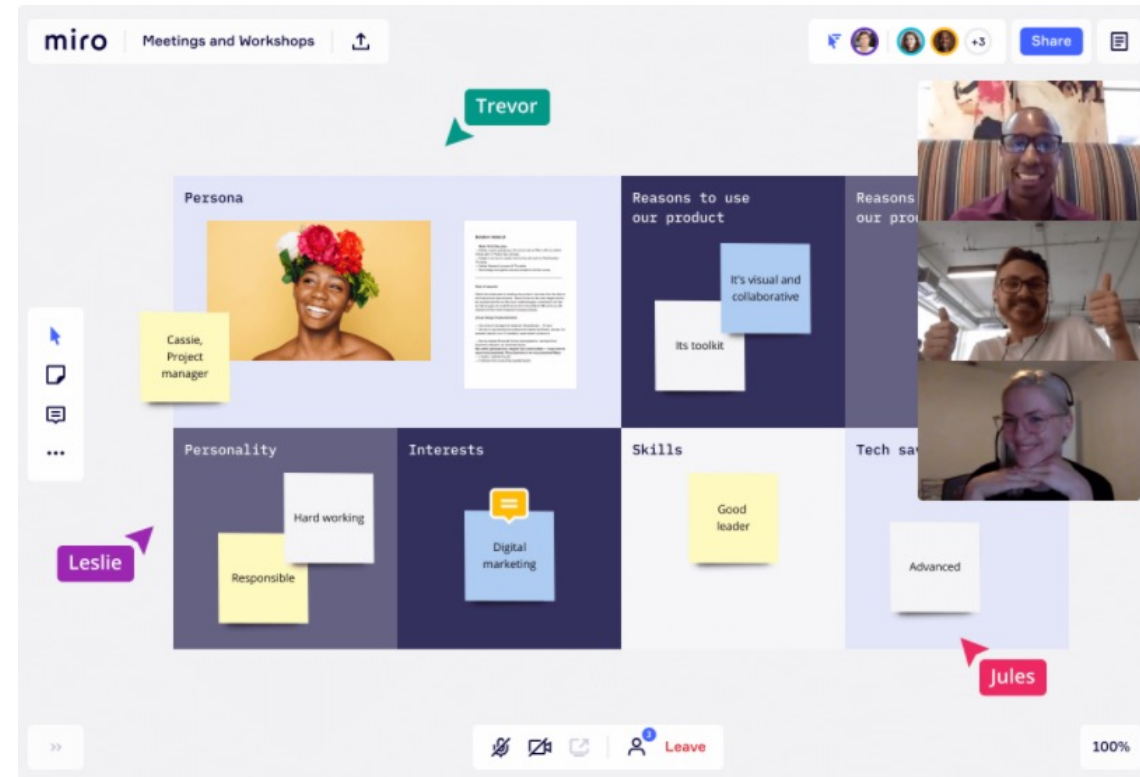
# 4. COLLABORATION + COMMUNICATION

- Establish culture of teamwork, collaboration and disciplined communication



# Sneak In a "mini-charrette" during kickoff

- Informal roundtable Q&A after introductions
- All-hands: owner, architect, civil, structural, interiors, acoustics, MEP, energy, builder...
- Ask questions.
  - What will make this project a success?
  - What should we know in order to work most successfully with you?
  - What lessons learned do you have from other projects you want to avoid on this one?



# Basis of Design (BOD)

- Now that we know WHERE we're going, HOW will we get there?
- BOD:
  - Outlines conceptual design approaches and how those support OPR
  - Encourages team collaboration and transparency
  - Helps catch potential issues before design proceeds too far
  - Improves accuracy of early pricing rounds





# BOD example for ventilation

## Outdoor Air + Exhaust

Fresh air ventilation is provided for the whole house by a balanced heat-recovery ventilation unit (HRV) located in the Lower Floor Utility space. The unit will continuously exhaust from the bathrooms, laundry, kitchen, and crawlspace and supply outside air to the living and bedroom spaces. Refer to Crawlspace Ventilation section for additional information. 8" round exhaust and intake ducts between the HRV unit and outdoors to be insulated w/ 1.5" (min R-4.2) continuous ductwrap. The intake and exhaust termination locations will need to be confirmed during the site visit. HRV operation to be a minimum 140 CFM continuous outside air. Each bathroom will have a boost switch to increase the CFM for a preset amount of time when energized (20 minutes is recommended). The main controller has four CFM % settings: absent, low, medium, and high. The HRV will operate at the high setting when the boost switch is activated and then revert to the main controller % setting after the boost period. Low setting to correspond with minimum code required CFM and be the default continuous setting of the HRV. Any existing bathroom exhaust fans can remain or be removed depending on owner's preference.

*Excerpts from Beyond Efficiency Basis of Design narrative for single-family home renovation*

### *Basis of Specification:*

- *HRV-1 Zehnder ComfoAir Q450 (29"Wx33"Hx22"D) heat recovery ventilator. Provide Zehnder wired boost switch with default setting of 20 minutes in bathrooms. Main controller Zehnder Comfosense C67 to be located by architect and owner.*

# BOD example for ventilation

## *Additional information for HRV:*

- ~ 3'x2' area for sound attenuator/manifold boxes required unless there is space available to install above the HRV.
- Manifold box number of tubing connections to be based on number of tubes required in final ventilation system design. Tubing from the manifold box to each supply or exhaust register to be Zehnder Comfoflex.
- Ceiling supply diffusers to be Zehnder Luna.
- Wall supply and exhaust registers to be Zehnder Roma. Ceiling exhaust registers to be Zehnder STB sized for CFM.
- Diffuser boxes to be Zehnder TVA 75 2 port or TVA 75 3 port for ceiling installation and Zehnder CLD75 register box for wall installation.
- There is a MERV 13 filter housing in outside air supply airstream internal to the unit.
- There is a MERV 7/8 filter housing in the exhaust airstream internal to the unit to protect unit.
- HFU-1 Hawk Environmental Airwash Whisper 350 (14.5"Wx14.5"Dx27.25"H) HEPA filtration system installed on the intake ductwork before the HRV for additional filtration when the outside air quality is poor. There will be an on/off rocker switch located in Utility to turn on the HEPA filtration unit when the outside air quality is poor. When the HEPA filtration unit wall switch is on, the outside air will be filtered through the HEPA filter. When the HEPA filtration unit wall switch is off, the outside air will bypass the HEPA filter.
- The Zehnder Q series will self-balance to the set CFM to compensate for the system pressure difference with and without the HEPA filtration unit operating. Ensure HEPA filter unit is easily accessible to the homeowner for switch out.
- Condensate drain required for HRV.

*Excerpts from Beyond Efficiency Basis of Design narrative for single-family home renovation*



PERFECT SEAL® HEPA

- Smart 360° cylindrical design
- 99.97% HEPA efficiency
- 100% leak-proof seal
- Washable foam pre-filter
- Activated carbon canister for VOC

# BOD conceptual narratives

- Require design disciplines to include summary narratives in title sheet
- Improve communication and save time for everyone!

## HVAC NARRATIVE

Passive House. Project will be built to Passive House standards. Ensure all penetrations through the continuous air barrier layer are sealed airtight to ensure stringent minimum blower door test result requirements are achieved. Refer to architectural plans for continuous air barrier layer location. Equipment substitutions will need to be reviewed to ensure project meets PH standards with equipment substitution.

All Electric. The home heating system is all electric with no gas heating.

Heating & Cooling. Heating and cooling are provided via an air-to-air electric heat pump system. The system will have a single outdoor heat pump unit (MHP-1) connected to two indoor air handlers (MFC-1, 2). The air handlers will have 4" deep filter boxes to accommodate MERV13 filters.

Ventilation for Indoor Air Quality (IAQ). Fresh air ventilation is provided for the whole house by a balanced heat-recovery ventilation unit (HRV) located in Mechanical 209. The unit will continuously exhaust from the bathrooms, mudroom/laundry, and kitchen and supply outside air to the bedrooms, living, den, and family. HRV operation to be a minimum 80 CFM continuous outside air. Each bathroom will have a boost switch to increase the CFM (approximately double minimum setting) for a preset amount of time when energized. The HRV will have a MERV 13 filter installed in the unit on the outside air and a MERV<sub>7</sub> filter installed on the exhaust air to protect the heat recovery core. There will also be a filter housing on the outside air duct to accommodate an active carbon filter.

Cooking Exhaust. Kitchen hood exhaust to be ducted to the exterior through the wall.

Makeup Air for Cooking Exhaust. Makeup air will be provided via a pressure-controlled makeup air system with a supply fan, MERV13 filter, and a low leakage control damper.

*Excerpt from Beyond Efficiency  
mechanical design plan set for new single-*

A

MECHANICAL  
GENERAL

PROJECT NO. 144

SHEET NUMBER

M0.01

M0.01

# Off track? Red flag waving?

- Don't put off the difficult conversation
- Don't be lazy and say "it's not my responsibility"
- Email is a double-edged sword
  - Easy to send the email and think "I've got my bases covered"
  - Hard to take the time to make the follow up call or schedule a meeting
- Just pick up the phone or hop on Zoom!
- Do what needs to be done!
- Avoid email ping-pong!



Copyright 1945, 1973 Random House

# 5. ROLES + RESPONSIBILITIES

- Define clear roles and actionable responsibilities
- Prepare early-phase project brief for each party outlining:
  - Project goals, certifications etc.
  - What's special about this project
  - Summary of their responsibilities and what you will be asking of them
  - Reference documents specific to each party

## What's Different for This Project

This project incorporates numerous high performance above-code features in the residences, including:

- High performance windows
- High levels of thermal insulation at slab, basement walls, framed walls & ceilings
- Highly airtight exterior building envelopes (max 1.0 ACH<sub>50</sub>)
- Mechanical ventilation with balanced heat recovery units (ERVs)
- Mini-split heat pumps for space heating
- Heat pump water heaters (HPWH)

*Excerpt from a Beyond Efficiency project brief*

# Keep people accountable

- And help team understand overall process and where they fit

#	MAJOR TASKS	DELIVERABLES	Sch.	DDs	CDs	OWNER	DUE	STATUS	NEXT ACTION	BY
1	Preliminary plan review, checklist + discussion	Green checklist	○			Green	4/1/15	-	Request project info from client	Green
2	Green kickoff meeting	Meeting minutes		○		Green		-	Send role-specific documents for review	Green
3	Responsibility acknowledgment forms	-		○		Green		-	Provide forms for signing	Green
4	100% DDs plan review	Plan review comments		○		Green		-	Provide 100% DD set	Arch.
5	Air sealing, QII + TBC planning meeting	Meeting minutes			○	Green		-		
6	Commissioning (Cx) planning meeting	Meeting minutes			○	Cx		-	Hire Cx authority	Owner
7	50% CDs plan + spec review	Plan review comments			○	Green		-	Provide 50% DD set	Arch.
8	Durability checklist facilitation	-			○	Arch.		-	Provide guidance docs	Green
9	T24 energy modeling, base model	Modeling assumptions			○	T24		-	Confirm baseline assumptions	T24
10	Energy optimization studies	Memo			○	T24		-	Confirm optimization studies to run	T24
11	100% CDs plan + spec review	Plan review comments			○	Green		-	Provide 100% CD set	Arch.
12	Title 24 documentation, permit submittal	Title 24 documentation			○	T24		-		
13	Green checklist update, permit submittal	Green checklist			○	Green		-		
14	Plan check comments	Memo				Green		-	Provide plan check documents	Arch.
15	Green program registration	-				Owner		-	Provide instructions to client	Green

Excerpt from a Beyond Efficiency Google Sheet template

# 6. PLANNING + ACTION

- Leverage tools to organize workplans, keep the team in sync and track progress

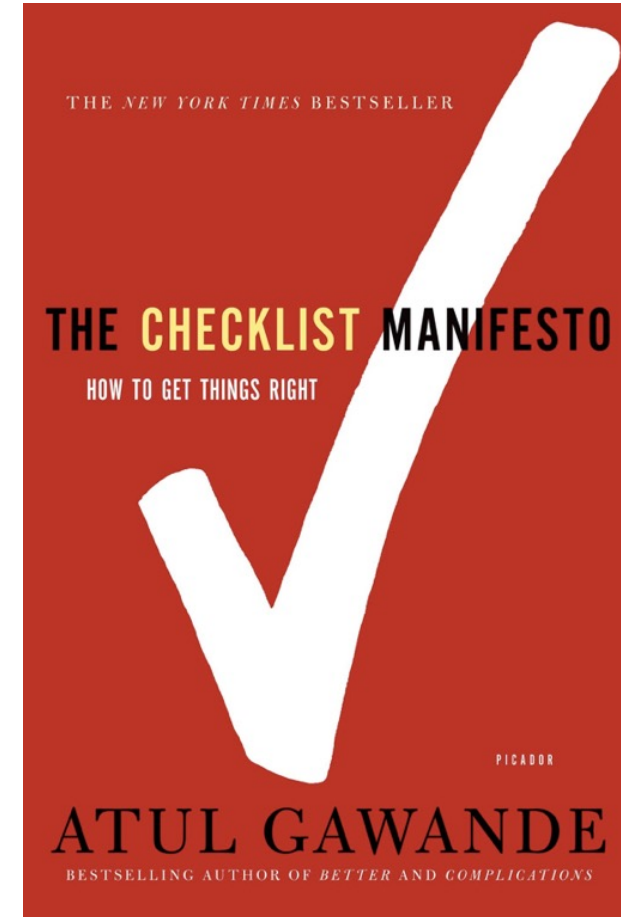
The screenshot shows an Airtable interface for a project management database. The header bar is orange and contains the text 'Project Hub' and several tabs: '\*Budget Items', 'MF Tasks', 'Key Tasks', and 'Tasks'. Below the header, there are filters and sorting options: 'Grouped by 2 fields', 'Sorted by 1 field', 'Color', and 'Grid automations'. The main table has the following columns: '\*Project Phase', '\*Task Status', 'Due Date', and 'Notes'. The table contains several rows of data, with task statuses ranging from 'Doing' to 'Can be done'.

*Project Phase	*Task Status	Due Date	Notes
T.O.D. / Approvals	Doing		Not meeting C
T.O.D. / Approvals	DONE	2/16/2021	2/17/21: Anoth
T.O.D. / Approvals	DONE	10/30/2020	Owner hopes
T.O.D. / Approvals	Doing		DBM to check
T.O.D. / Approvals	DONE	1/8/2021	1/6/21: DBM s
T.O.D. / Approvals	DONE	2/26/2021	2/17/21: client
T.O.D. / Approvals	DONE	3/31/2021	3/29/21: Duct
T.O.D. / Approvals			
T.O.D. / Approvals	Ongoing		Submittals rev
T.O.D. / Approvals			usually two sit
T.O.D. / Approvals	Can be done		Provide Place

Screenshot from Beyond Efficiency's Airtable project management database

# The Checklist Manifesto

- “The modern world has given us stupendous know-how, yet avoidable failures continue to plague us...”
- “...the volume and complexity of knowledge today has exceeded our ability to properly deliver it...”
- This book discusses:
  - what checklists can do, what they can't, and how they could bring about striking improvements in various industries





# Critical paths + risks

- “Given a chance, most people will either under-plan or not plan at all” – Kimberly Wiefeling
- Call attention to “big, hairy, abominable risks”
  - Mechanical engineer doesn’t trust Passive House
  - Contractor doesn’t trust your load calcs
  - Contractor throws out your design
  - Low-load system doesn’t pair well w/ thermostat setbacks
  - Envelope gets VE’d; what does this mean for your design?
- What can go wrong? How can you avoid or mitigate?

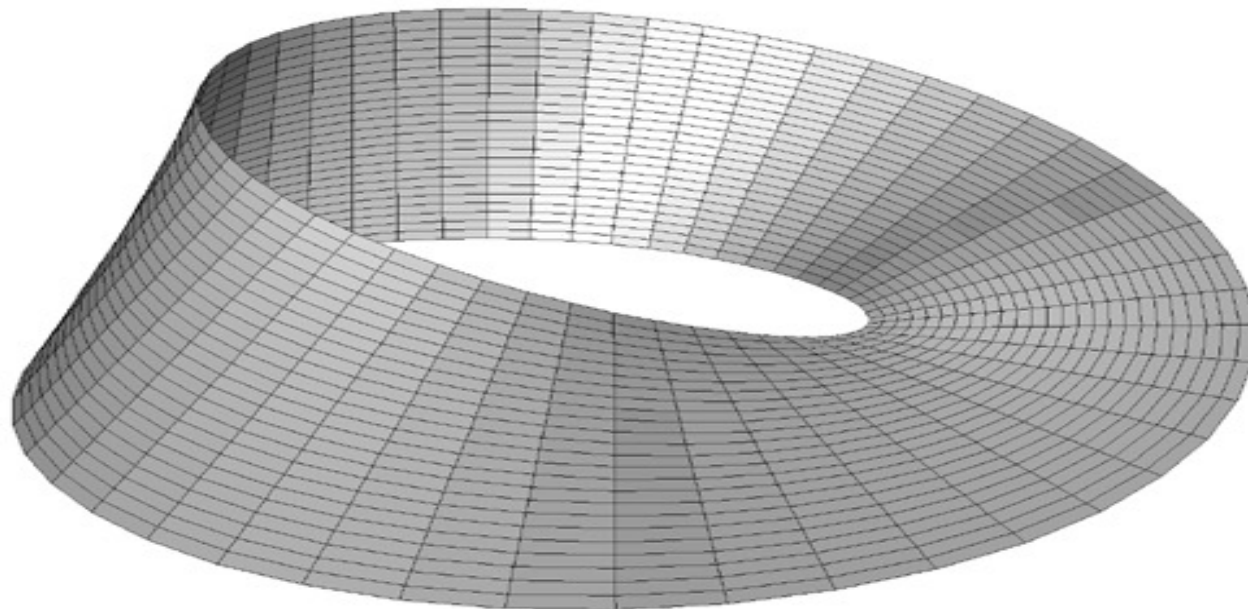
## Key Assumptions for Load Calculations

Changes to these assumptions will require reevaluation of the heating and cooling systems selected. Note that to achieve the envelope air tightness target, a comprehensive and systematic air sealing strategy will need to be developed during the design phase and verified during construction with blower door testing performed by a 3<sup>rd</sup> party HERS Rater.

*Excerpt from a Beyond Efficiency Basis of Design document*

# 7. MONITORING + FEEDBACK

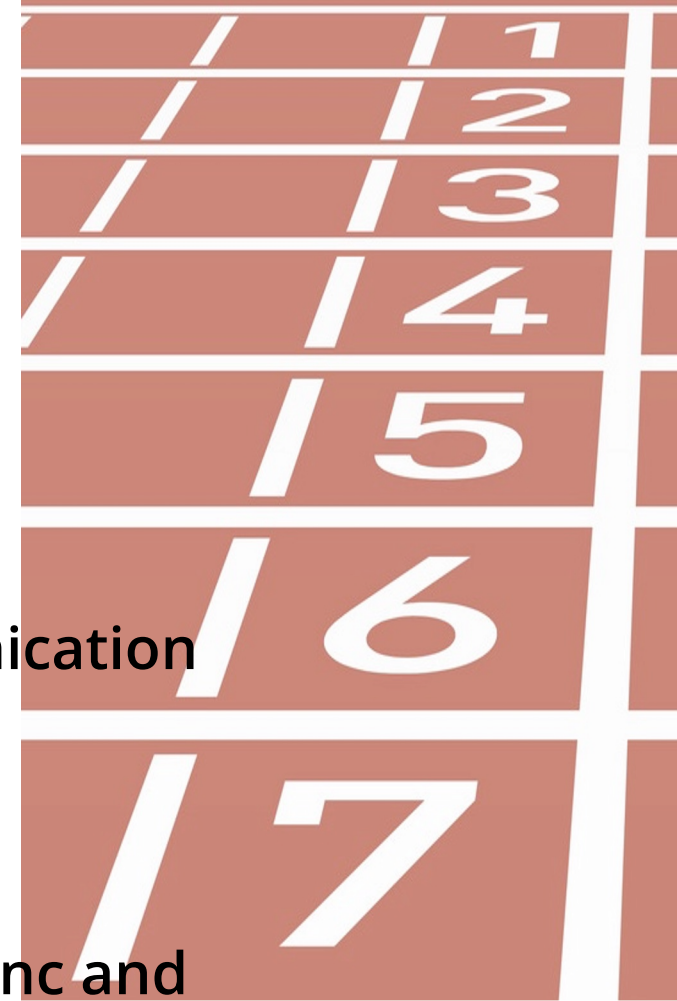
- Hooray, we did it!! (all done?)
- Not so fast. FEEDBACK is critical!
  - Bring lessons learned back home and make different mistakes next time
  - Schedule “internal team debrief” during project closeout
  - Log lessons learned in a knowledge base



# Go Get Scrappy!

Bringing it all together

- 1 Attitude + Commitment**  
Bring "can-do" attitude and unapologetic commitment to excellence
- 2 Vision + Goals**  
Learn client's motivations and set clear measurable goals
- 3 Education**  
Establish common knowledgebase and inspire passion
- 4 Collaboration + Communication**  
Establish culture of collaboration and disciplined communication
- 5 Roles + Responsibilities**  
Define crystal-clear roles and actionable responsibilities
- 6 Planning + Action**  
Leverage tools to organize workplans, keep the team in sync and track progress
- 7 Monitoring + Feedback**  
Learn what worked and make different mistakes next time



# Questions?

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