WHAT ENGINEERS OUGHT TO KNOW

A CONTRACTOR'S PERSPECTIVE

~~SOME THINGS THAT YOUNG (AND SEASONED!) PROFESSIONALS SHOULD HAVE IN THEIR TOOLBOX~~

- A Contractors Perspective

WHAT ENGINEERS OUGHT TO BE ~~COCNIZITAVE~~ OF

- A Contractor's Perspective
  - ~~COGNATIZIVE~~
  - ~~CONGNAZITIVE~~
  - ~~CONGNISANT~~
  - ~~COGNISANT~~
  - AWARE


WHAT ENGINEERS OUGHT TO KNOW
A CONTRACTOR'S PERSPECTIVE

ASHRAE CODE OF ETHICS

ASHRAE CODE OF ETHICS

In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and we shall avoid all real or perceived conflicts of interests.

MANY THANKS TO OUR GENEROUS HOST!

PSI
PROCTOR
SALES INC

INTRODUCTIONS

- POLL OF THE GROUP
- ABOUT THE SPEAKER
  - LATE 60s
  - MID TO LATE 70s
  - 80s
  - 90s
  - 00s
  - TO PRESENT

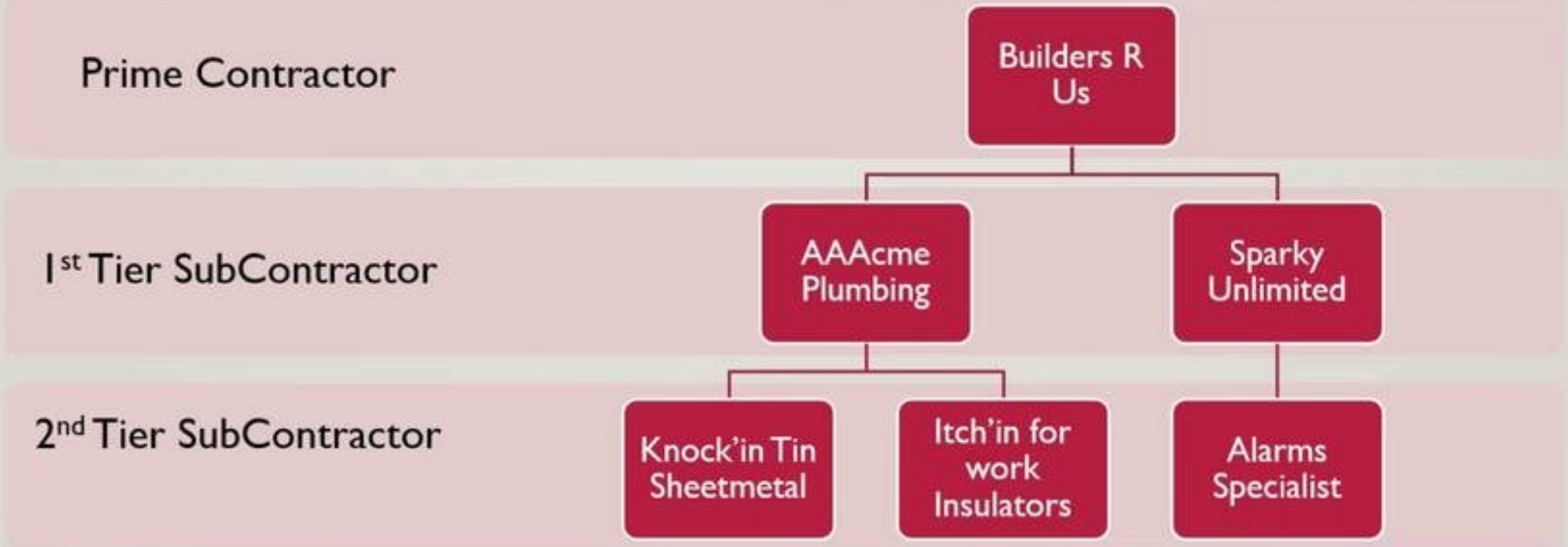
WHAT WE'RE NOT GOING TO DISCUSS TODAY

- $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$
- $(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$
- $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, \ -\infty < x < \infty$
- $\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$
- NONE OF THIS

WHAT WE WILL DISCUSS

- Contractor Hierarchy
- Vertical Construction Bid Preparation Process
- Project Delivery Methods
- Lessons Learned
- Considerations Moving Forward

CONTRACTOR HIERARCHY



VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Assess the Project Announcement or ITB
  - Current Workload Commitments
  - Client Considerations
  - Prime Contractor Considerations
  - Geographic and Logistical Considerations
  - Timeline Considerations – PoP, Expected NTP, LDs, and Expected Completion
  - Future Workload Commitments
  - Labor Resources Available
  - Sub-Contractor or Prime Contractor

VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Obtain the Project Documents – Plans, Specifications, and Agreement if available
  - Thorough Assessment of the Project Specific Requirements:
    - Quality of the Design
    - Division 01 General Requirement Review
    - Division 02 Existing Conditions Review
    - Special and Supplementary Conditions
    - Bonding and Insurance Requirements
    - Scope Specific Division Assessment – Divisions 22, 23, 25 – 33, 40

VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Obtain the Project Documents – Plans, Specifications, and Agreement if available
  - Issues That Must Be Considered:
    - Is the Budget Reasonable?
    - Reasonable Amount of Time to Offer a Responsible Proposal?
    - Competition That Can be Expected?
    - Project Specific Items? BAA, Proprietary Design Considerations
    - Is the Anticipated Schedule Reasonable?

VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Preparing the Proposal
  - Building the Cost Sheet
    - Perform the take off-of materials and equipment
    - Define 2nd Tier Sub Scope Delineation and Distribute
    - Request Pricing for materials and equipment
    - Determine direct labor values
    - Supply Chain Issues
    - ODCs
    - Contingencies
    - Thorough Review of the 2nd Tier Proposals

VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Preparing the Proposal – Continued
  - Building the Cost Sheet – Continued
    - Getting Questions Answered Early
    - Review of Amendments and Addenda
    - Determine Mark-Up
    - Research of Viable Prime Contractors
    - Putting it All Together and Detailed Review – Misses = $
    - Check It Again – 2nd Set of Eyes

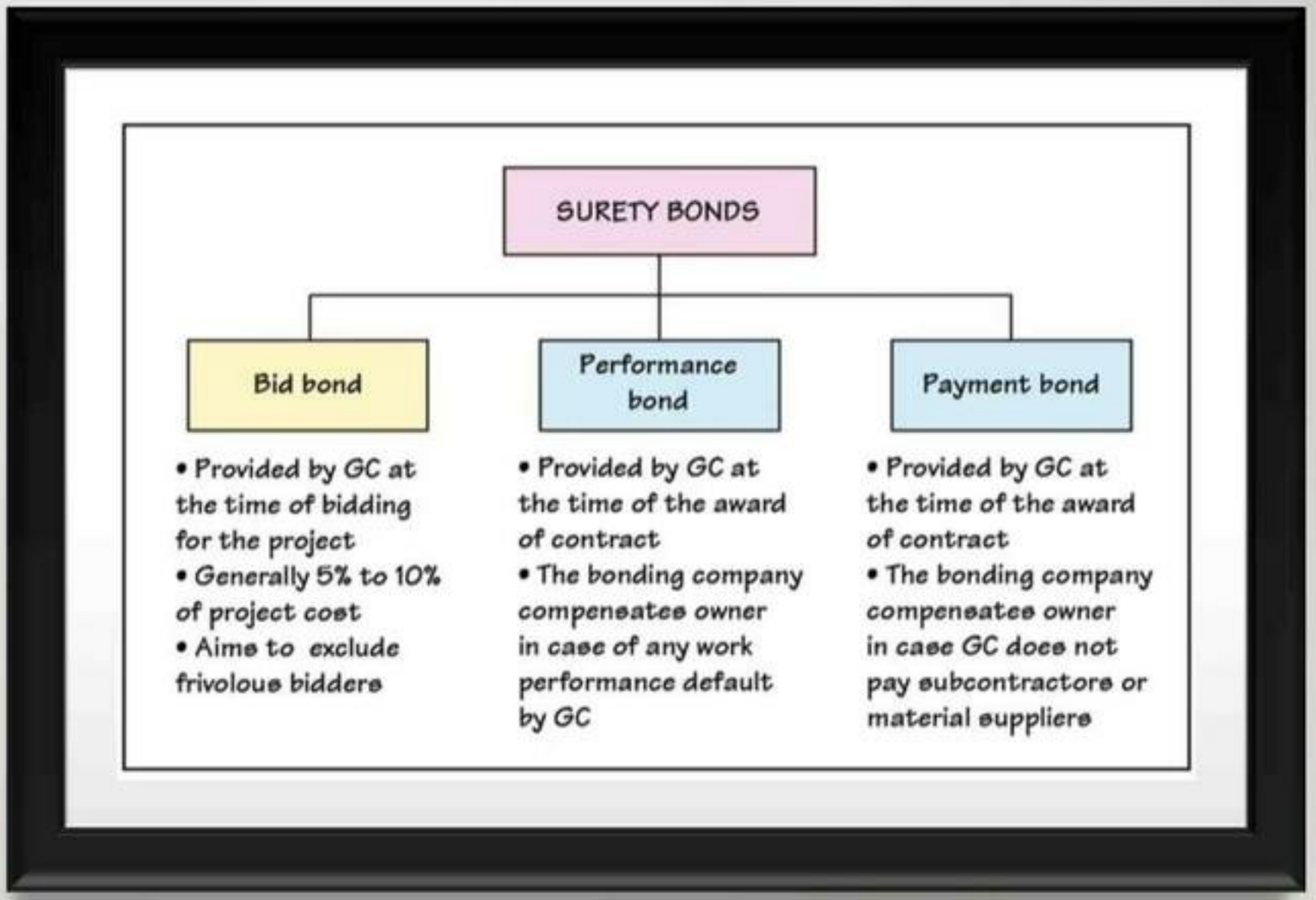
VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Building the Scope Letter
  - Defining the Scope with Project Specific Narrative
  - Project Specific Exclusions and Inclusions
  - General Exclusions and Inclusions
  - Assumptions and Clarifications
  - Final Review of Scope Letter

VERTICAL CONSTRUCTION BID PREPARATION PROCESS

- Preparing the Proposal
  - Proposal is Basically the Scope Letter With the Pricing Added
  - Keeping Your Subs, Vendors, Suppliers On Schedule
  - Prime Contractors Want Scope Letters 48 Hours Prior to Proposal Due Time
  - Prime Contractors Want Proposals 6 - 12 Hours Prior to Proposal Due Time
  - Timing of Transmitting Your Proposal
  - Waiting Period After Proposal Submission
  - 2nd Place = 1st Loser

BID PREPARATION PROCESS - BONDING



BID PREPARATION PROCESS – LABOR COST

Aaron Plumbing & Heating Co.
Union Wage/Benefits Schedule
As Of July 2021
Jan 2020 Tax
GL & WC Ins Sept 2020

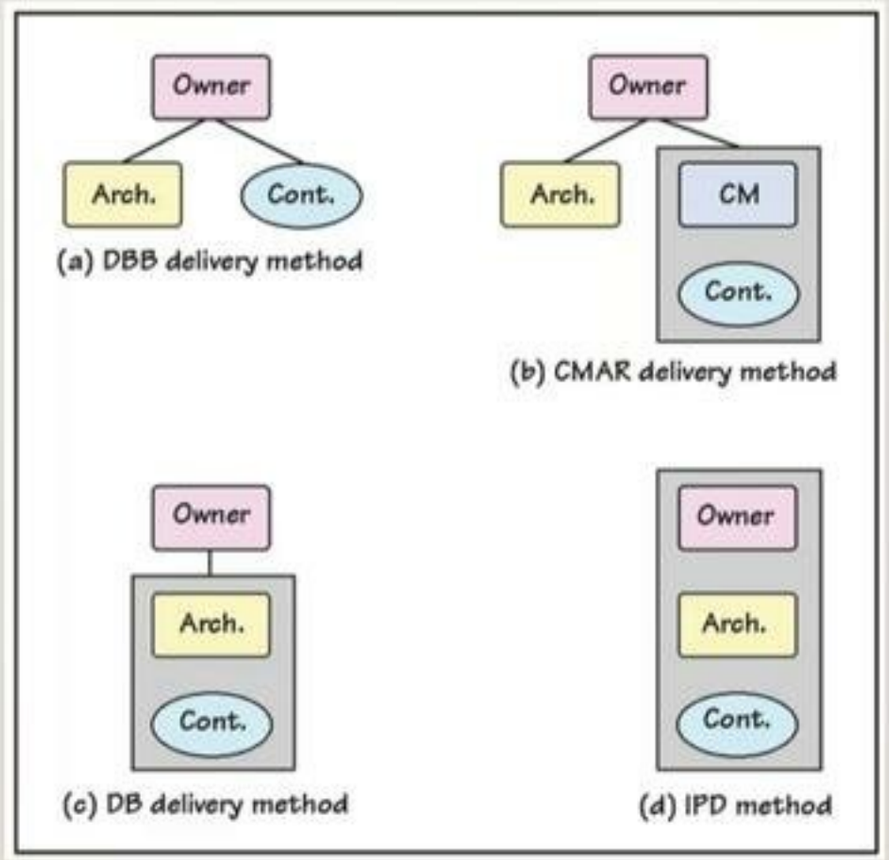
Local 375

		JOURNEYMAN HOURLY WAGE	OT	FOREMAN HOURLY		GENERAL FOREMAN HOURLY WAGE	OT	80% APP HOURLY WAGE	OT	75% APP HOURLY WAGE	OT	70% APP HOURLY WAGE	OT	60% APP HOURLY WAGE	OT	50% APP HOURLY WAGE	OT
BASE (GROSS) PAY		42.91	64.37	48.27	72.41	53.10	79.65	38.44	57.66	34.73	52.10	31.01	46.52	23.59	35.39	21.27	31.91
ALASKA PENSION FUND		13.45	13.45	13.45	13.45	13.45	13.45	5.61	5.61	5.61	5.61	5.61	5.61	5.61	5.61	0.50	0.50
UNION NATIONAL PENSION		1.00	1.00	1.00	1.00	1.00	1.00	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
SUPPLEMENTAL PENSION		3.00	3.00	3.00	3.00	3.00	3.00	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
HEALTH/SECURITY FUND		11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75
TRAINING FUND (APPRENT)		1.50	1.50	1.50	1.50	1.50	1.50	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
ERISA TRUST FUND		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
LABOR/MGMT FUND		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
UNION PACKAGE		74.26	95.72	79.62	103.76	84.45	111.00	59.41	78.63	55.70	73.07	51.98	67.49	44.56	56.36	37.13	47.77
WORKERS COMP. INSURANCE	3.12%	1.34	2.01	1.51	2.26	1.66	2.49	1.20	1.80	1.08	1.63	0.97	1.45	0.74	1.10	0.66	1.00
GENERAL LIABILITY INSURANCE	0.9097%	3.39	0.586	0.44	0.659	0.48	0.72	0.35	0.52	0.32	0.47	0.28	0.42	0.21	0.32	0.19	0.29
UNEMPLOYMENT TAXES FED & ST	1.50%	3.64	0.97	0.72	1.09	0.80	1.19	0.58	0.86	0.52	0.78	0.47	0.70	0.35	0.53	0.32	0.48
PAYROLL TAX - FICA/MED	7.65%	3.28	4.92	3.69	5.54	4.06	6.09	2.94	4.41	2.66	3.99	2.37	3.56	1.80	2.71	1.63	2.44
SUBTOTAL INS/TAX		5.66	8.48	6.36	9.54	7.00	10.50	5.07	7.60	4.56	6.87	4.09	6.13	3.11	4.66	2.80	4.20
TOTAL COST		**79.92**	104.20	**85.98**	113.30	**91.45**	121.50	**64.48**	86.23	**60.28**	79.93	**56.07**	73.62	**47.67**	61.02	**39.93**	51.97

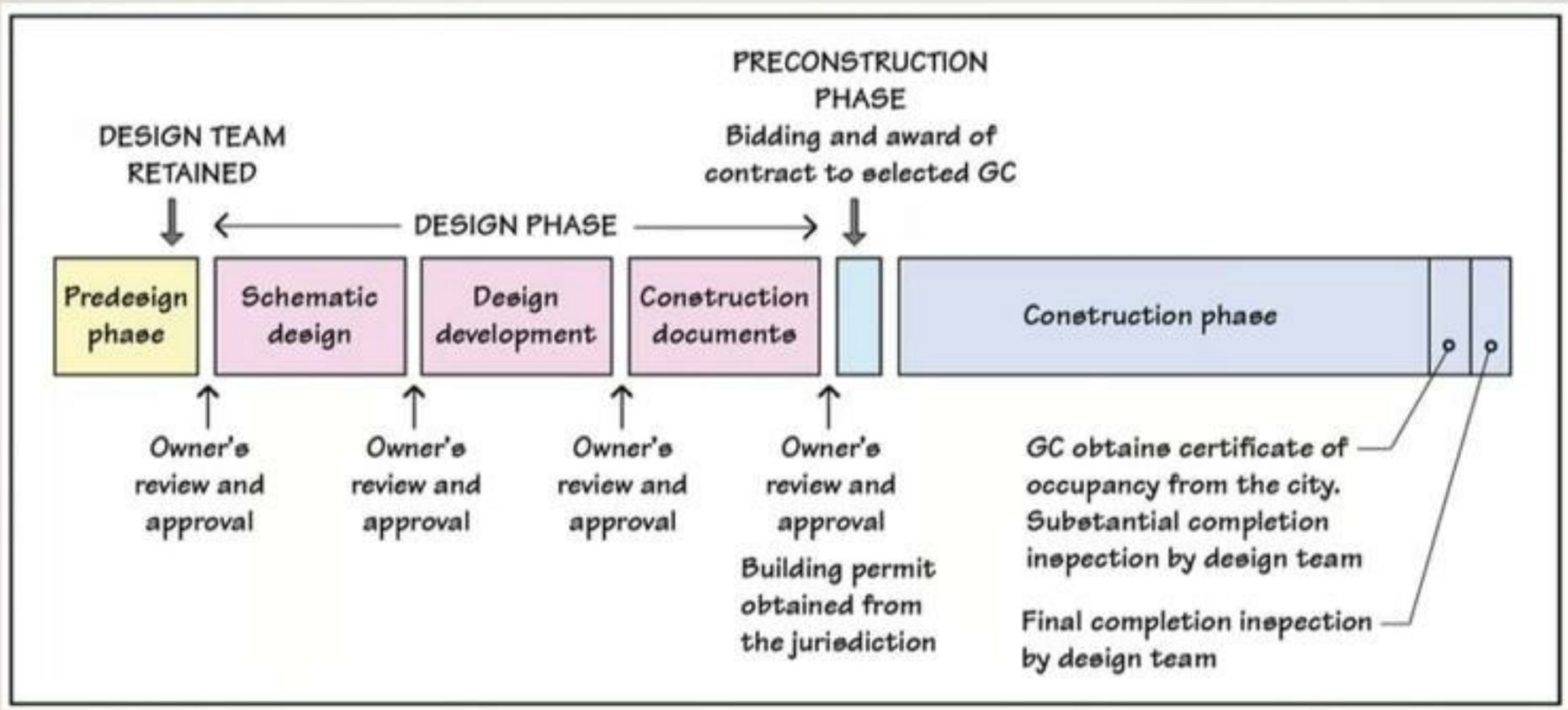
PROJECT DELIVERY METHODS

- Plan & Spec, or Bid Build, or Design Bid Build – BB / DBB
- Construction Management – CM
- Design Build – DB
- Integrated Project - IP

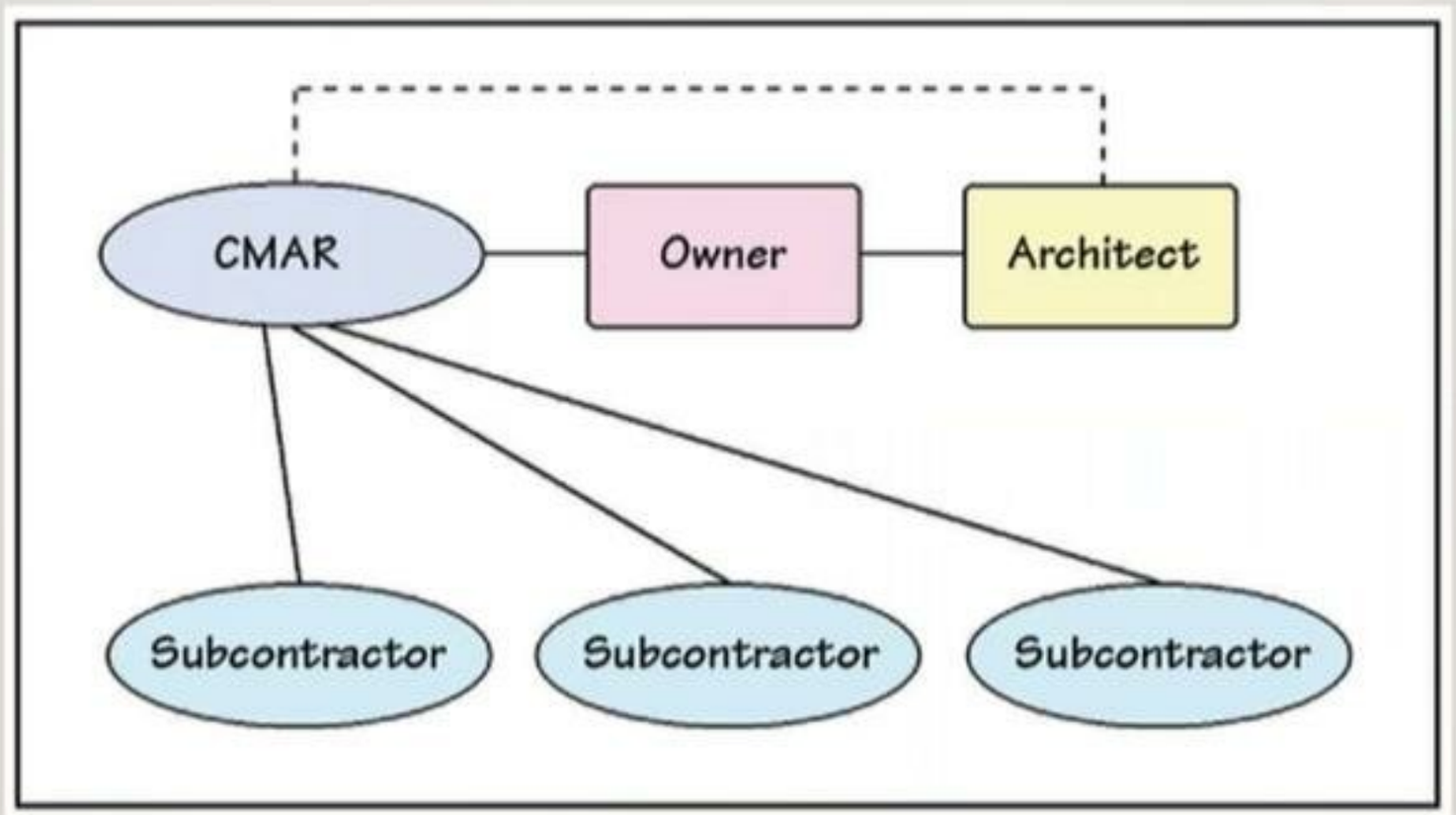
PROJECT DELIVERY METHODS



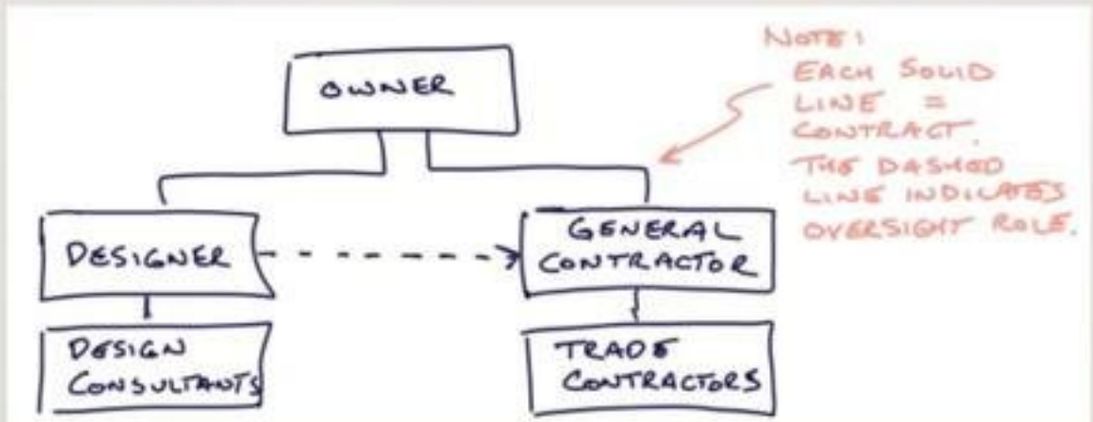
PROJECT DELIVERY METHODS
BB OR DBB



PROJECT DELIVERY METHODS
CONSTRUCTION MANAGER AT RISK



PROJECT DELIVERY METHODS
BB / DBB

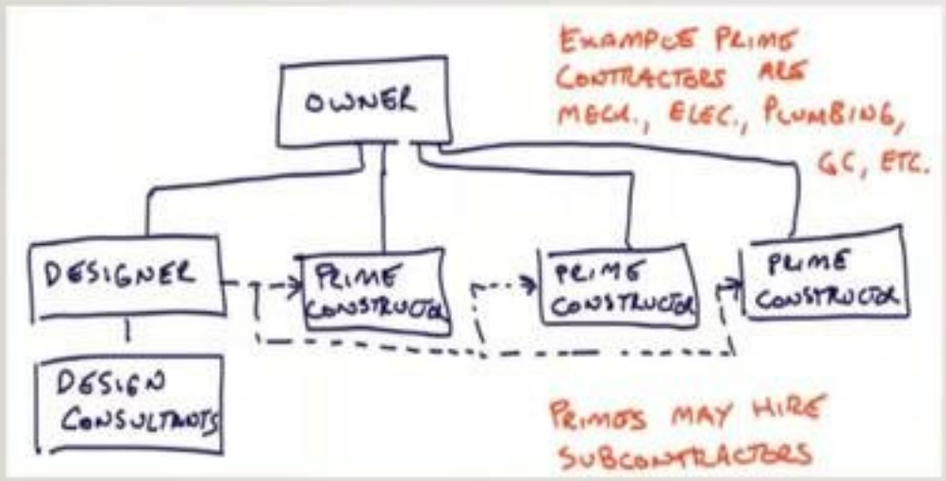


Project Delivery Method	Description
Design-Bid-Build (DBB) Delivery (Competitive Sealed Bids)	The oldest and most familiar project delivery method. Construction work is awarded to the general contractor (GC) with the lowest bid through open aggressive bidding. There is no design-phase assistance from the GC, and hence a lack of coordination between the design and construction processes. The exact price is unknown until bidding process is complete. Commonly used for public projects.
Design-Bid-Build (DBB) Delivery (Competitive Sealed Proposals)	Same as the DBB (competitive sealed bid) method, except that the owner's selection of the GC is based not only on cost but also on several other criteria such as the project schedule, safety record, and qualifications of the GC's personnel. Commonly used for public projects.

PROJECT DELIVERY METHODS
CMAR

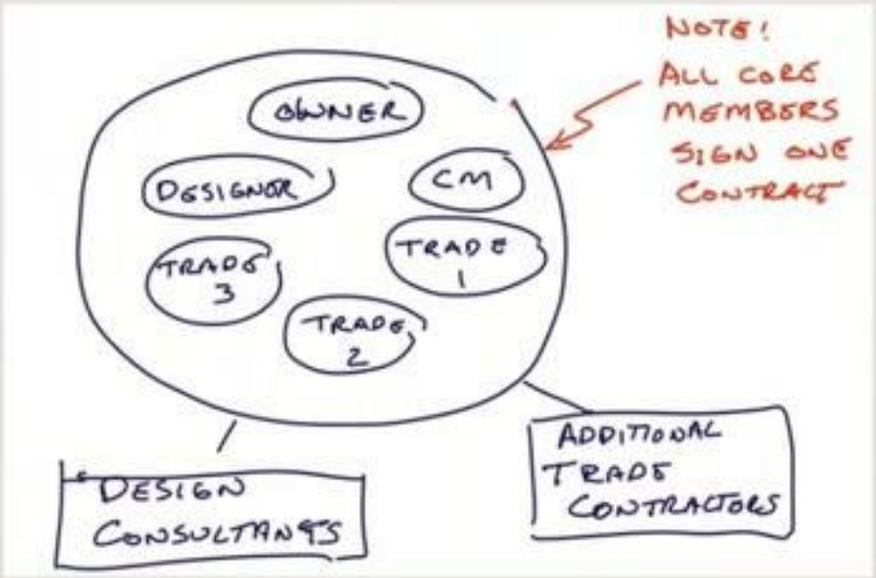
Construction Manager at Risk (CMAR) Delivery	In this method, which has largely replaced the CMAA method, the CM performs two sequential roles. In the first role, the CM works as the owner's representative and provides design-phase assistance to the architect. For this role, the CM is paid a fee. In the second role, the CM functions as the GC after the completion of the design phase, and is compensated under a conventional owner-contractor agreement with all attendant risk and liability; hence, the CM is called CMAR. The CMAR obtains competitive bids from subcontractors, as in a DBB method. Used for both private and public projects.

PROJECT DELIVERY METHODS
DB



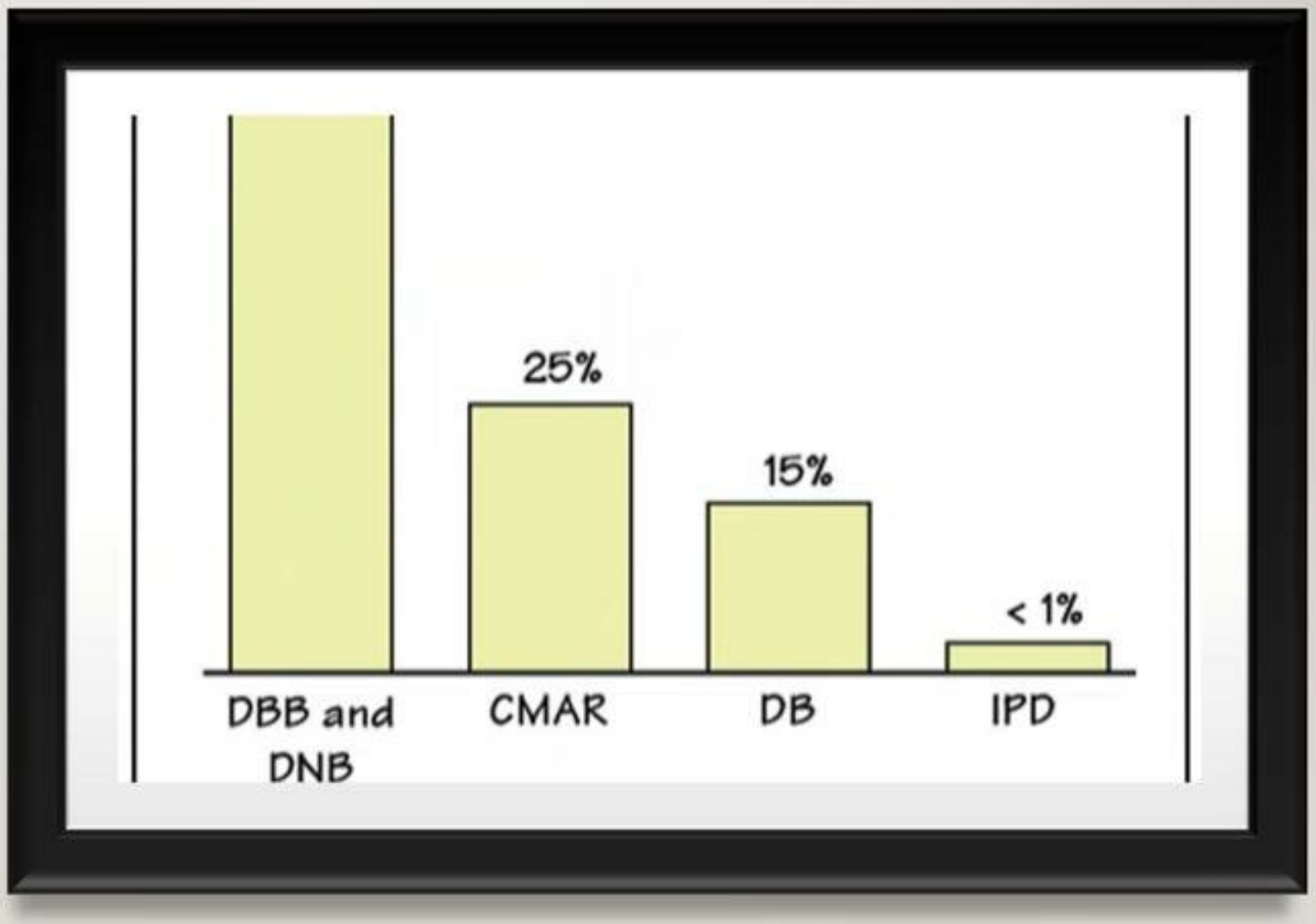
Design-Build (DB) Delivery	In all previous methods, there is a lack of collaborative relationship between the design and construction teams—a lack that is addressed in this method because both design and construction work are awarded to one firm, called a design-build firm. The method generally saves time and cost to the owner, but to be successful, the owner's program must be precisely defined at the beginning of the project. Used for both private and public projects.

PROJECT DELIVERY METHODS
IPR



Integrated Project Delivery (IPD)	This method, which is still evolving, differs substantially from all other methods. It requires complete collaboration among the owner, architect, and GC in a zero-blame and zero-litigation environment. For successful integrated delivery, a virtual model of the project is constructed (using building information modeling, BIM) during the design phase with collaboration from all parties—owner, architect, consultants, GC, subcontractors, fabricators, material suppliers, so on.

PROJECT DELIVERY METHODS MARKET SHARE



LESSONS LEARNED

LESSONS LEARNED

- MIKA!! Money is King – Always (Well…almost always)
- Beware of the Marble – Path of Least Resistance
- Never Stop Learning
- Ignorant Doesn't Mean You're Stupid, and Arrogant Doesn't Mean You Know What You're Doing.
- Acknowledge Your Weaknesses and React Accordingly – Revel in Your Strengths
- Strive to Be a Good Communicator – It Is Important and much easier to do in todays world

LESSONS LEARNED

- Question Things That Don't Make Sense

LESSONS LEARNED

P/E of 332 – Typical Good P/Es are 10 – 30
2021 Tesla Delivered 936,000 Vehicles
2021 10 Leading Manufacturers Delivered ~63,000,000. 2019 values were 73,000,000

LESSONS LEARNED

- Money is King – Always
- The Poindexter
- How much does my design cost, and what can I do to make it more cost effective? Is it Within the Clients Budget?
- RFI – much better to ask a question while providing the solution you'd like to see
- Try and Be Diplomatic – When Possible – Sometimes Impossible
- Redundant Information – Friend or Foe?

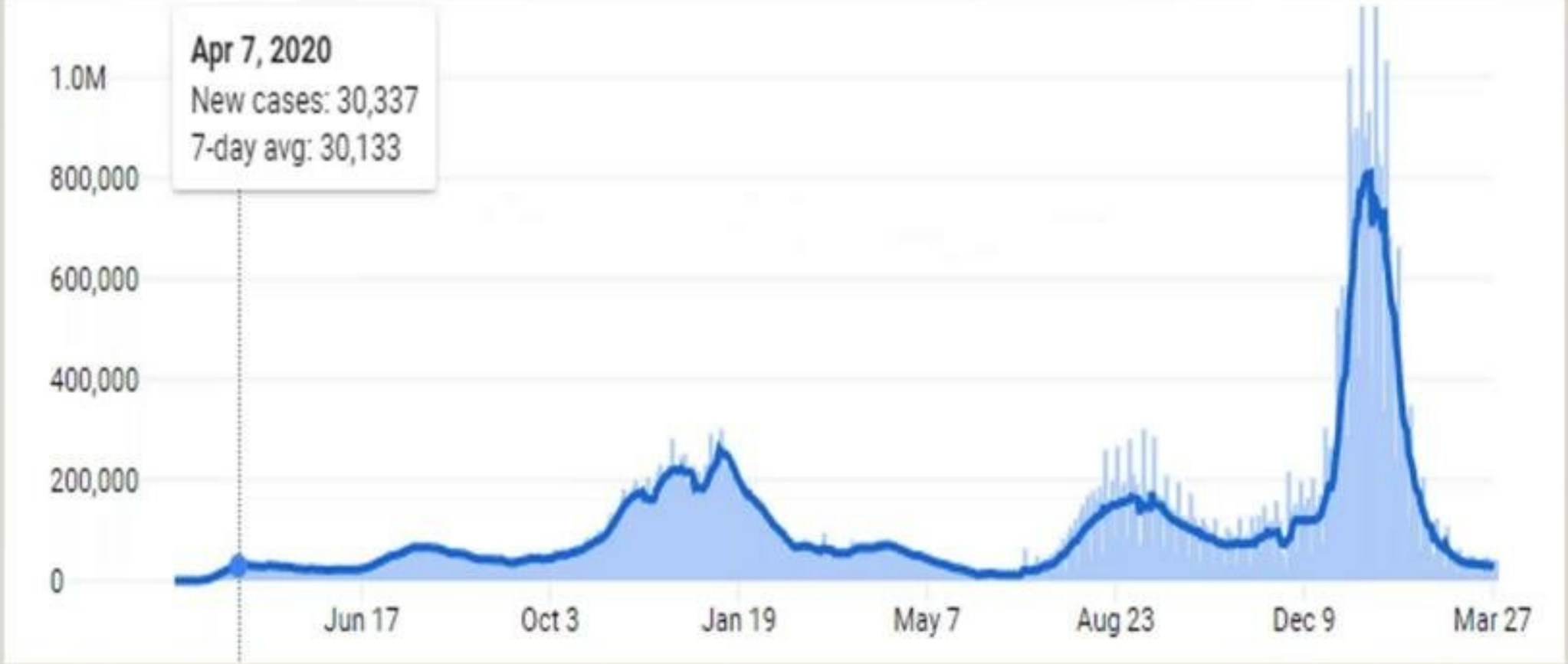
LESSONS LEARNED

- E&O Policy
- Proprietary Specifications and Equipment Selections – "No Substitute" wording
- Proprietary Tools

FUTURE CONSIDERATIONS

- 727
- Days Since Corona Virus Restrictions in Alaska and Begin of the Global Shut Down.

FUTURE CONSIDERATIONS



FUTURE CONSIDERATIONS

- https://en.wikipedia.org/wiki/Timeline_of_the_COVID-19_pandemic_in_the_United_States_(2020)#:~:text=%3Cp%3E%3Ca%20href,Link%3C/a%3E%3C/p%3E

FUTURE CONSIDERATIONS

- Russia's Invasion on Ukraine
- Inflation
- Interest Rates

APHCO

AARON PLUMBING & HEATING CO.

Tom Fisher
President
tomfisher@aaronak.com

2143 Standard Avenue
Fairbanks, Alaska 99701
website: www.aaronak.com

Phone: 907-452-3463
Mobile: 907-378-2804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38°F Sunny | 1:32 PM 3/30/2022