BUILDING FIRE STATIONS

Alternative Project Delivery Methods

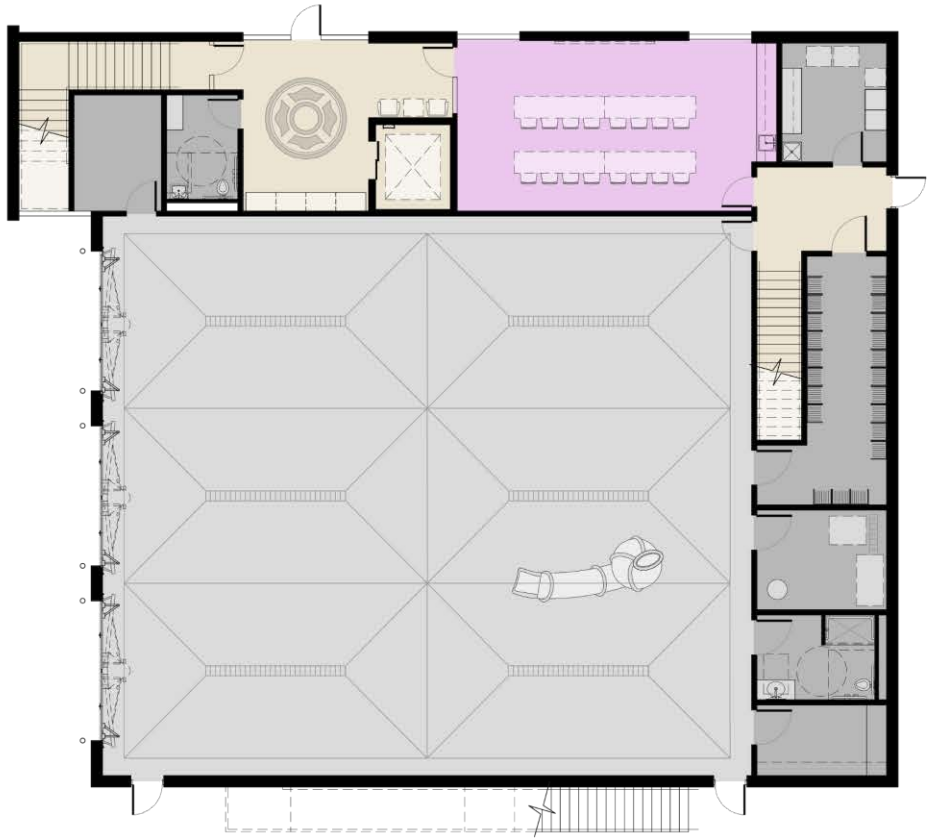
martinez ARCHITECTS

S A F E - D 2 0 2 0

TO BUILD A FIRE STATION – HOW HARD CAN IT BE?

DESIGN IT ...

1st Floor



2nd Floor

Utility | Apparatus | Office | Workout | Sleeping | Living | Training | Circulation


CITY OF MIDLAND
FIRE DEPARTMENT
5
... BUILD IT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5
FANTASY
REALITY
WHY CAN'T IT BE THAT EASY?

JUST GET RID OF ALL THE EXTRA STUFF ...


KLEIN FIRE
DEPT.
HCESD No.16
KLEINFIRE.ORG

FIRE STATION – BUILDING COST FACTORS

- THICKENED CONCRETE / HARDENED STRUCTURE
- VEHICLE EXHAUST SYSTEMS
- EMERGENCY GENERATOR
- DURABLE 50+ YEAR MATERIALS
- BUILDING CODE – FIRE RATINGS & FIRE SUPPRESSION
- LABOR RATES, SAFETY PROGRAMS, INSURANCE, BONDS, ETC.
- CERTIFIED, LICENSED, LEGAL SUB-CONTRACTORS
- ENERGY CODE
- ACCESSIBILITY CODE
- STORM DRAINAGE / GROUNDWATER

3 OPTIONS WHEN FACED WITH REALITY

- **QUIT**
- **CUT CORNERS**
- **MAKE A PLAN**
  - FINANCIAL PLANNING
  - STAFFING & ELECTION PLANNING
  - TRAINING PLANNING
  - EMERGENCY PLANNING
  - **BUILDING PLANNING → BUILDING COMMITTEE**

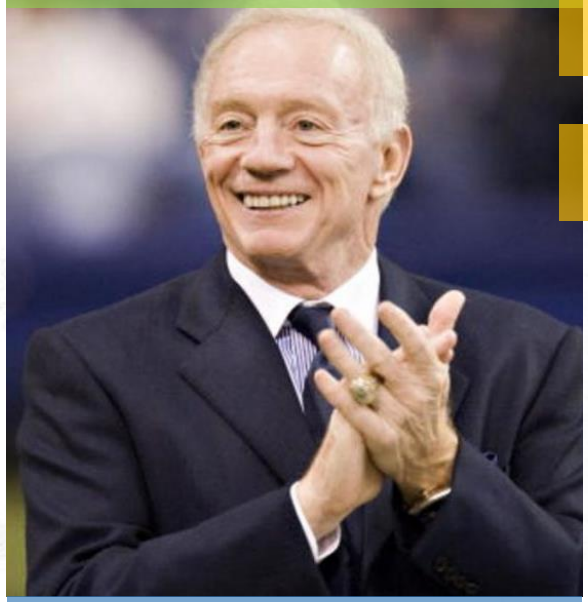
PLAN : Build a Team

- **Project Delivery Methods** are different ways to Contract with the people who can get your Fire Station built.

1) **DESIGN – BID – BUILD**
2) **DESIGN – BUILD**
3) **CONSTRUCTION MANAGER**
    a) CONSTRUCTOR (@ RISK)
    b) ADVISOR / AGENT
4) **INTEGRATED PROJECT DELIVERY (IPD)**

WHO ARE THE MEMBERS OF THE TEAM?

OWNER (ESD)



- BUILDING COMMITTEE

PROGRAM MANAGER

GM

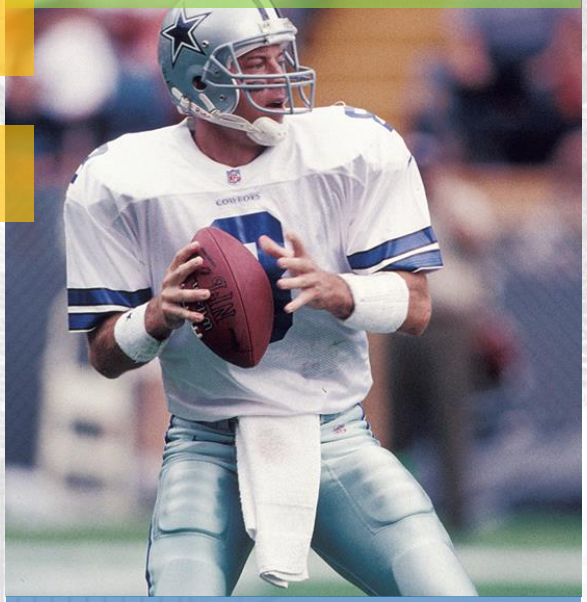
ARCHITECT

- CIVIL ENGINEER
- STRUCTURAL ENGINEER
- M/E/P ENGINEER
- LANDSCAPE ARCHITECT
- TECHNOLOGY DESIGNER

CONSTRUCTION MANAGER

ANALYTICS

CONTRACTOR



- SUB-CONTRACTOR
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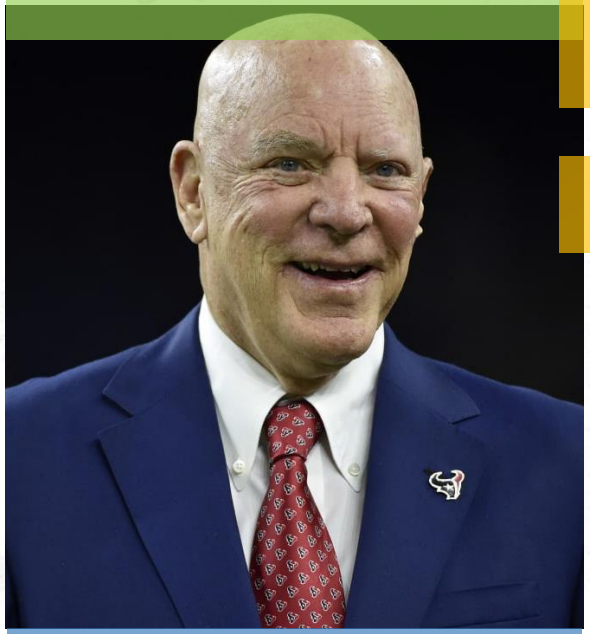

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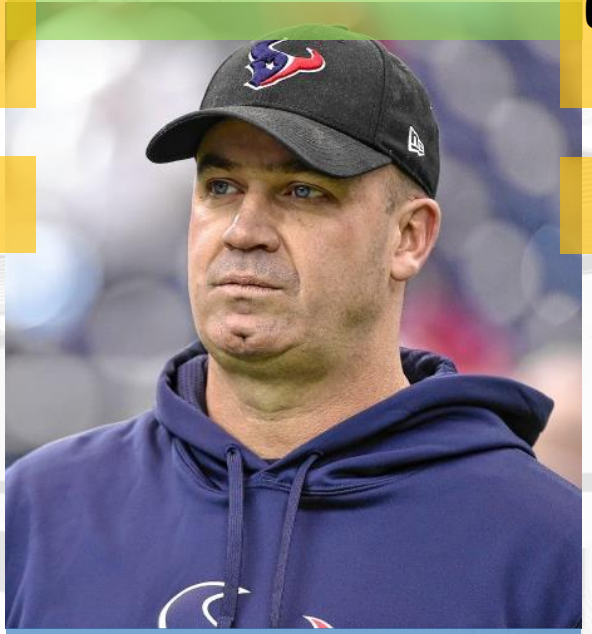

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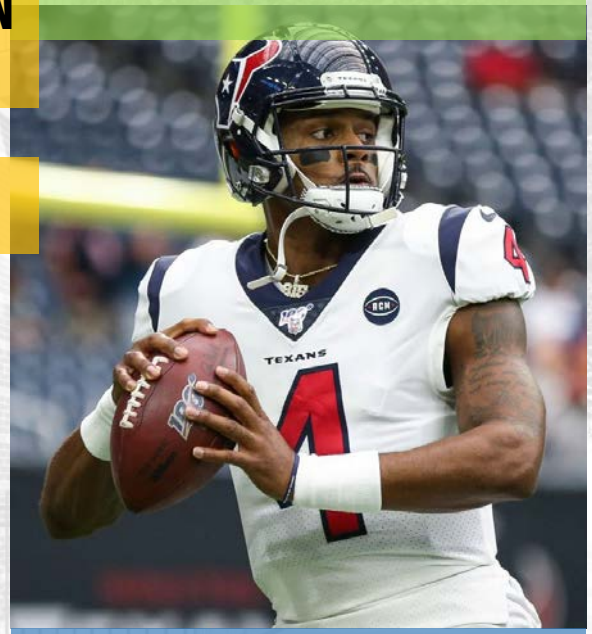

- SUB-CONTRACTOR
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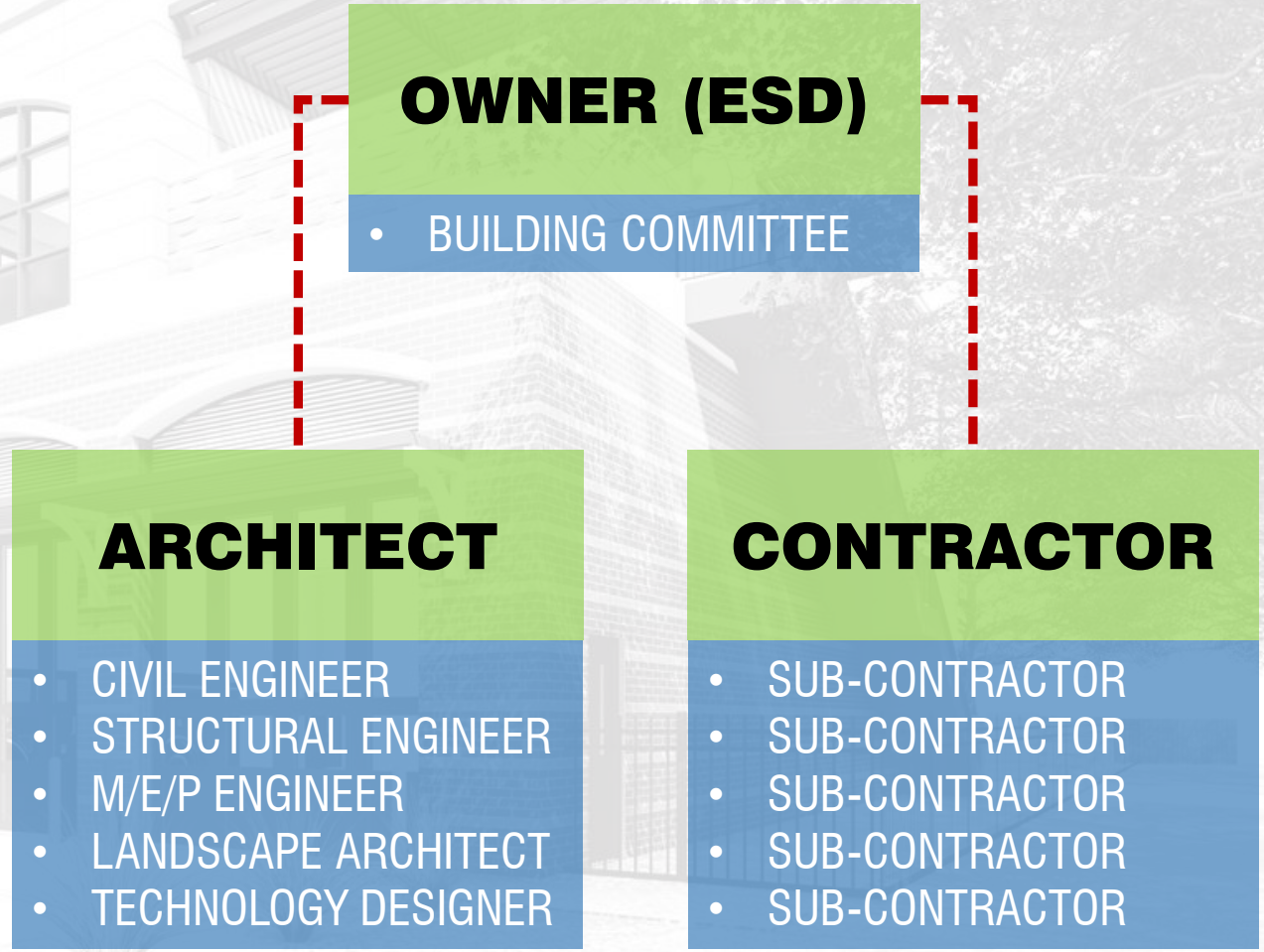
DELIVERY METHODS - OVERVIEW

DESIGN-BID-BUILD

Characteristics
- Two contracts (Architect & Contractor)
- Best understood
- Linear sequence of work (longest delivery)

Primary Reason to Choose
- Increased Owner involvement
- Procurement laws are well defined
- Low first cost (Bidding)

Disadvantages
- Final cost changes: Owner responsible
- Most litigious
- Contractor has no input during design



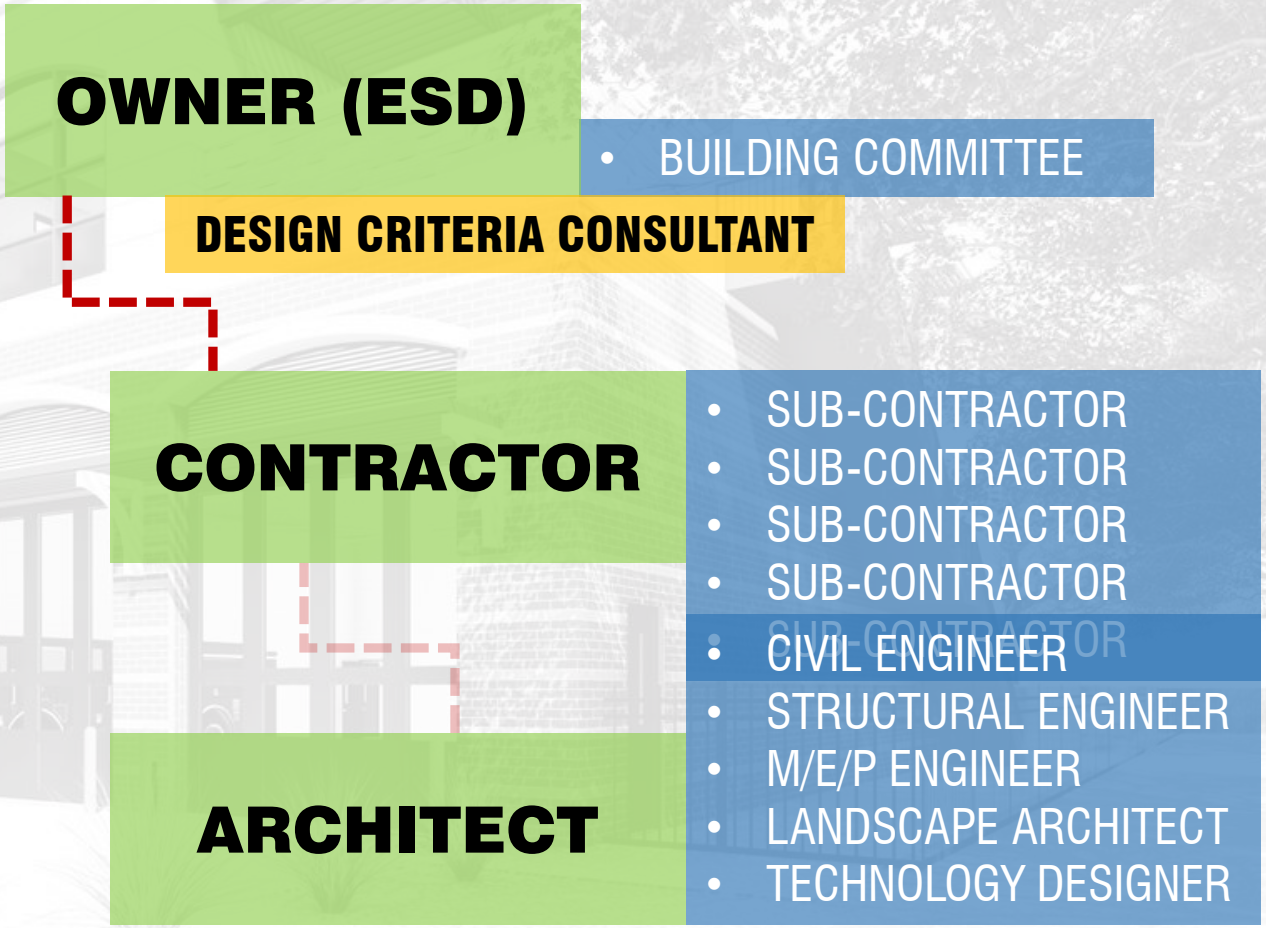
DELIVERY METHODS - OVERVIEW

DESIGN-BUILD

Characteristics
- Single Contract for Owner
- Contractor provides or retains Architect
- Introduces Design Criteria Consultant

Primary Reason to Choose
- Guaranteed Maximum Price
- Can be the fastest / least expensive
- Single point of Contact for Owner

Disadvantages
- Unclear role of Design Criteria Consultant
- Less checks/balances for Owner
- Builder selected by Qualifications only



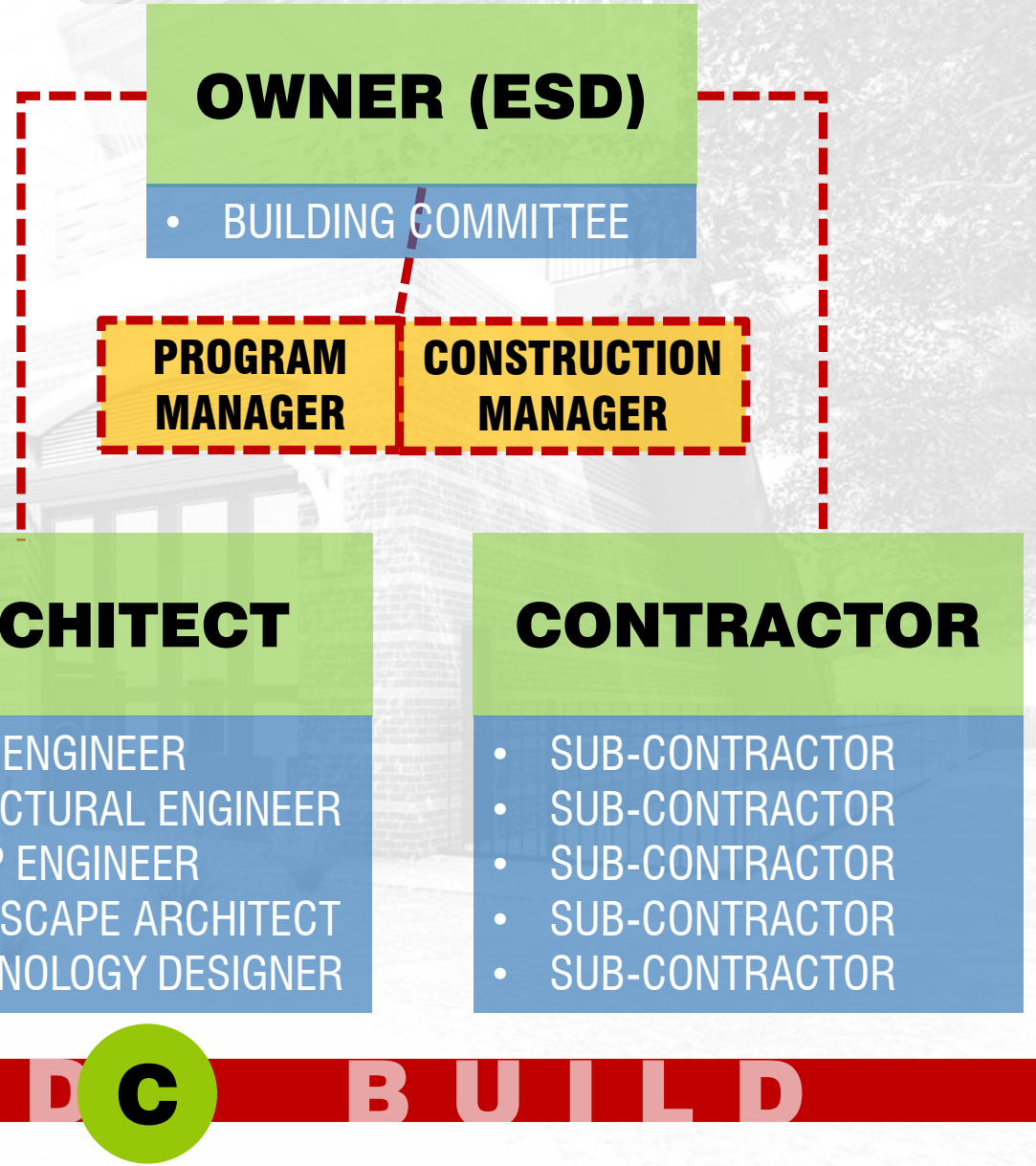
DELIVERY METHODS - OVERVIEW

CM – AGENT

Characteristics
- CMA serves as Owner Representative
  - Pre-Design thru Construction, as needed
- Other than CMA, usually similar to D-B-B

Primary Reason to Choose
- CMA can assist with Architect selection
- CMA is true owner rep, with no “Risk”
- CMA can provide Cost Estimating

Disadvantages
- Owner has multiple Contracts
- Can cost more up-front
- Architect & CMA may overlap duties



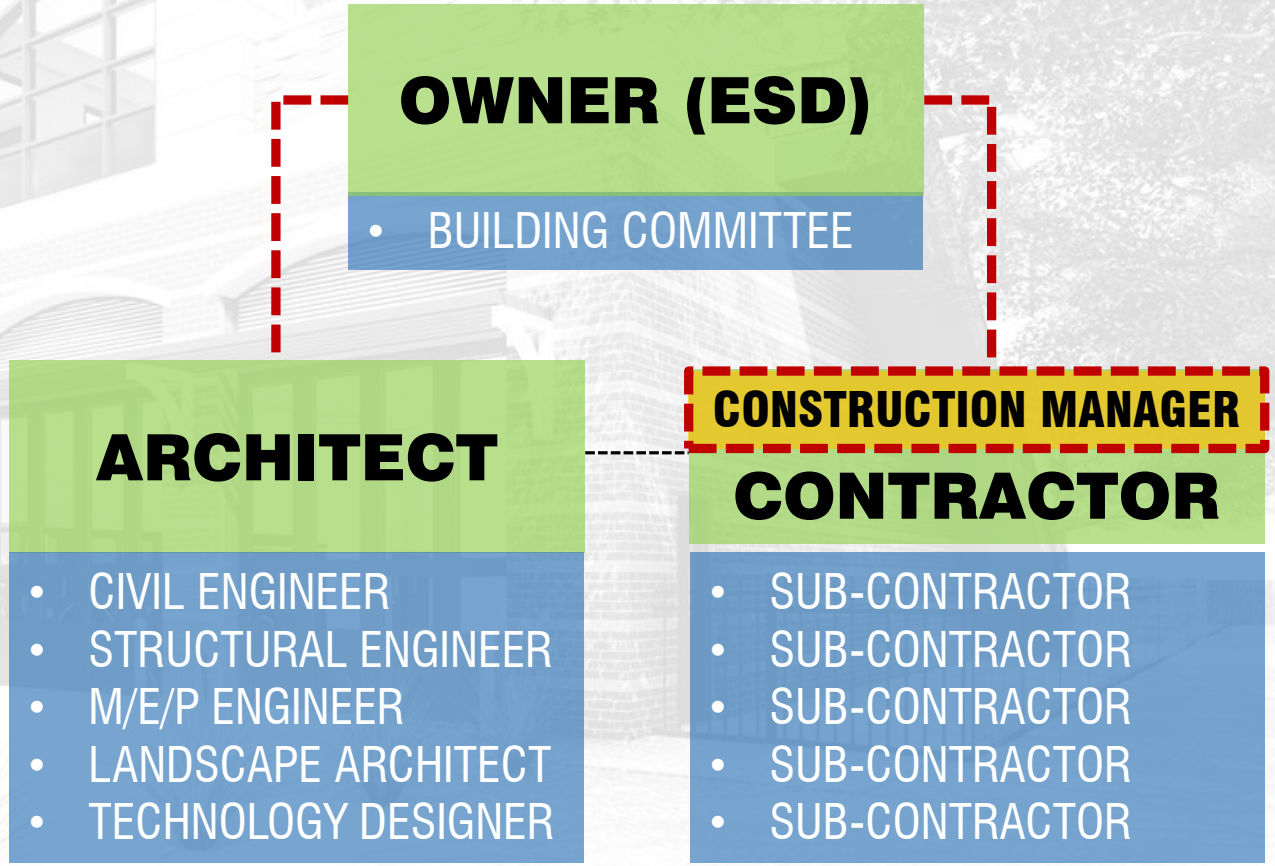
DELIVERY METHODS - OVERVIEW

CM @ RISK (CONSTRUCTOR)

Characteristics
- CMR is contracted during design
  - CMR is also Builder
- Owner contracts directly with Architect

Primary Reason to Choose
- Guaranteed Maximum Price
- CMR provides input during Design
- Collaborative Team Environment

Disadvantages
- Fewer qualified General Contractors
- Potential for less competition in pricing
- CMR may retain some project savings



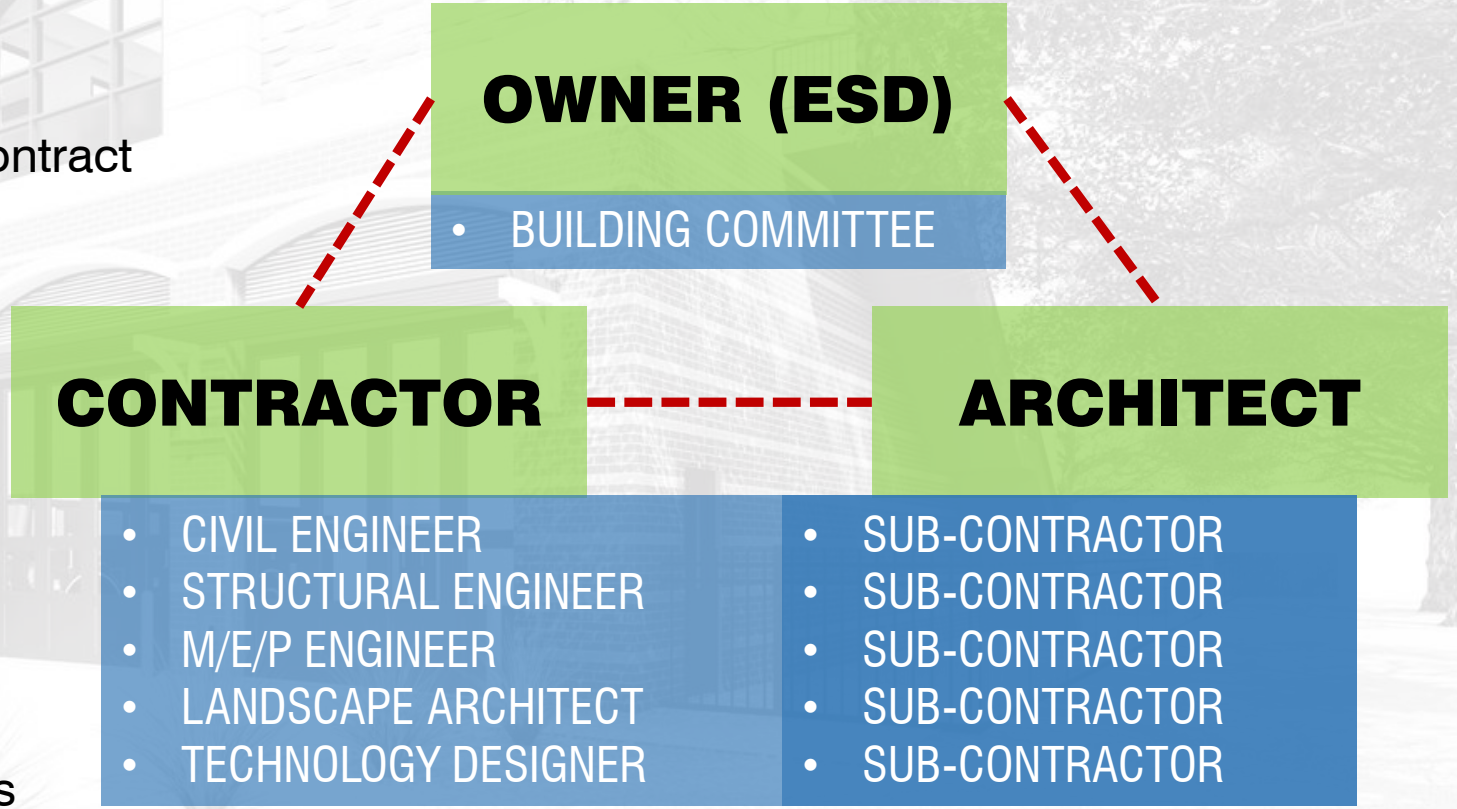
DELIVERY METHODS - OVERVIEW

INTEGRATED PROJECT DELIVERY

Characteristics
- A Single contract binds at least (3) entities
  - Sub-Consultants can also be part of contract
- All Team Stakeholders contracted Day 1

Primary Reason to Choose
- Highly collaborative for complex projects
- Shared Goals and Rewards
- High early effort at beginning of project

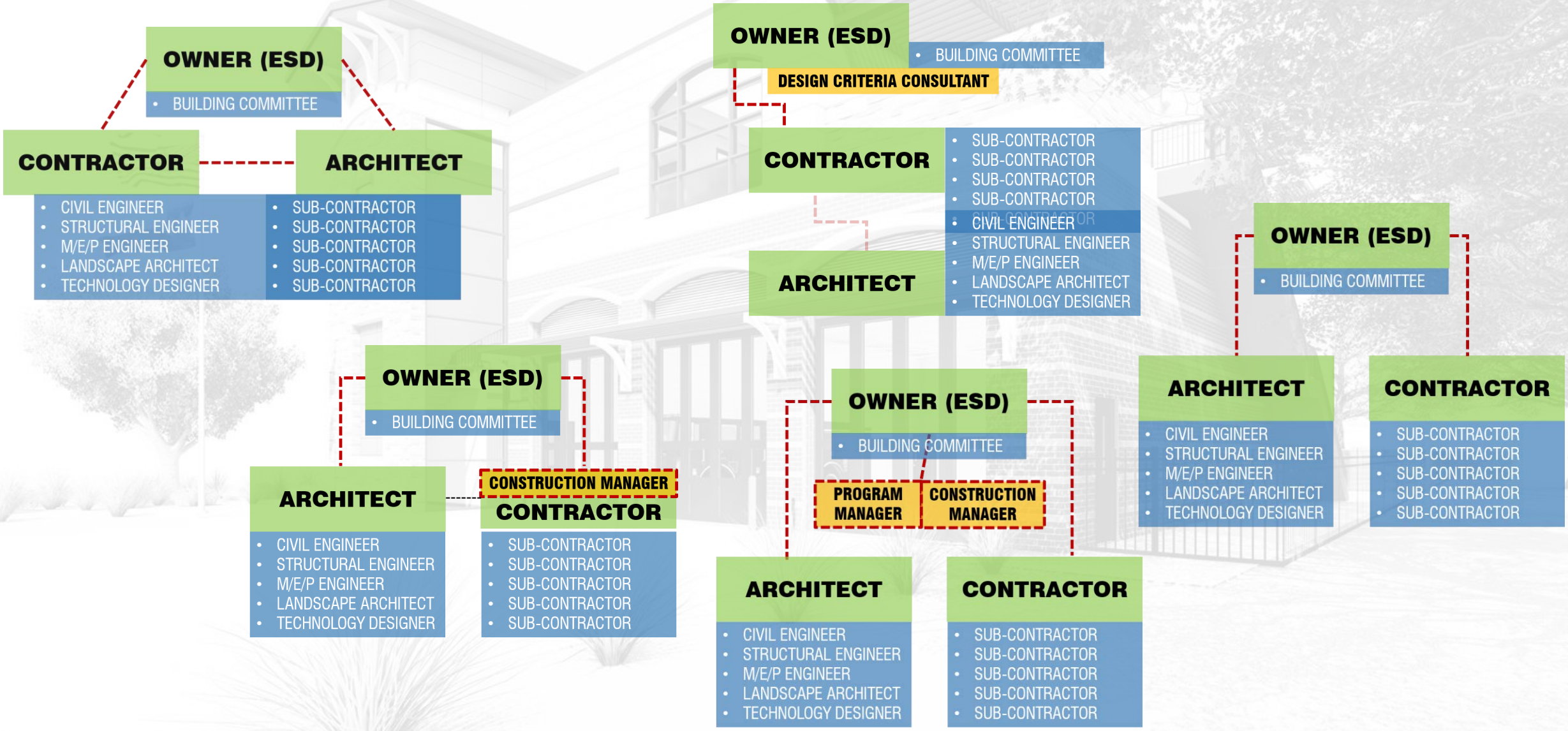
Disadvantages
- Not very common yet
- More complicated Contract
- Shared Liability between Contract Members



C O A

D E S I G N B I D B U I L D

DELIVERY METHODS - ANALYSIS



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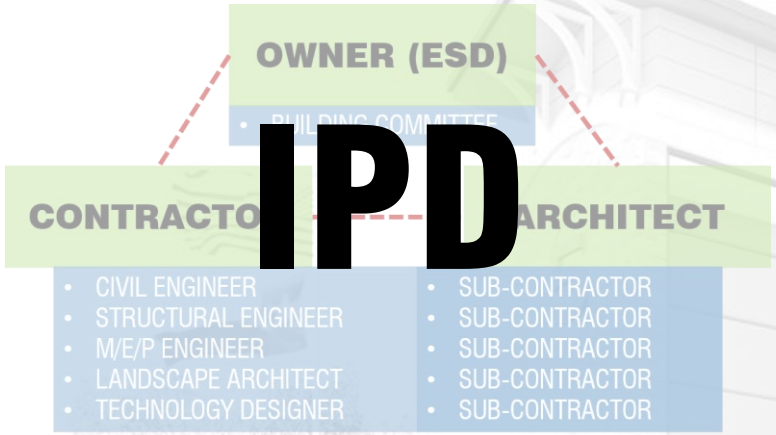
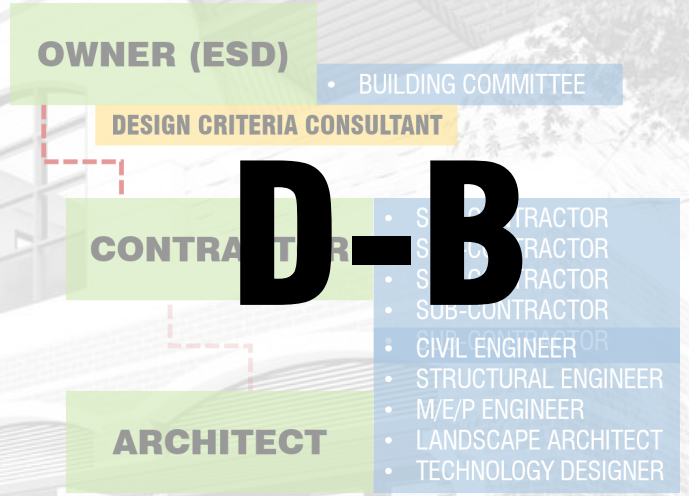
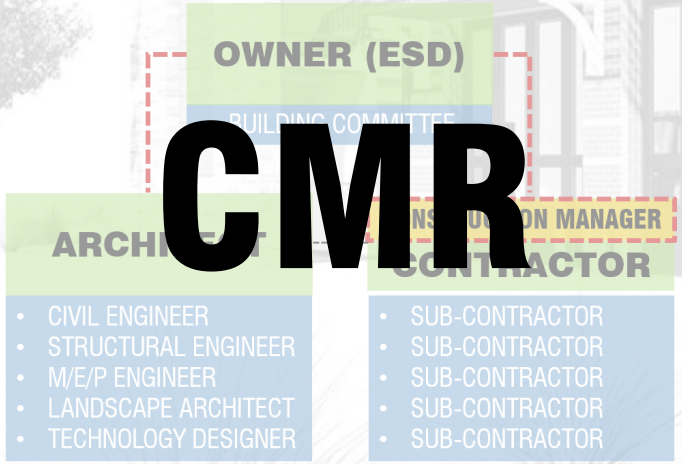


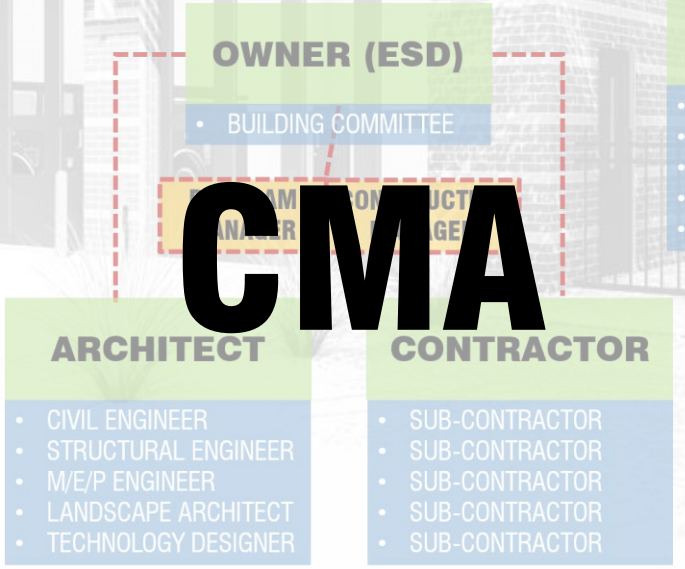
IPD



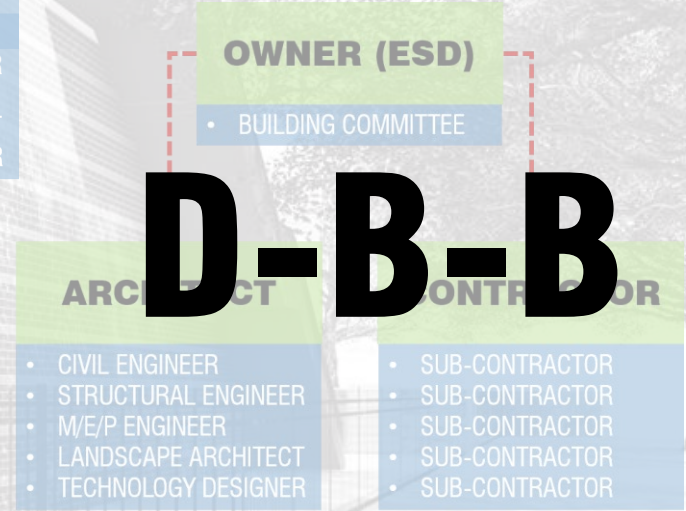
D-B



CMR



CMA



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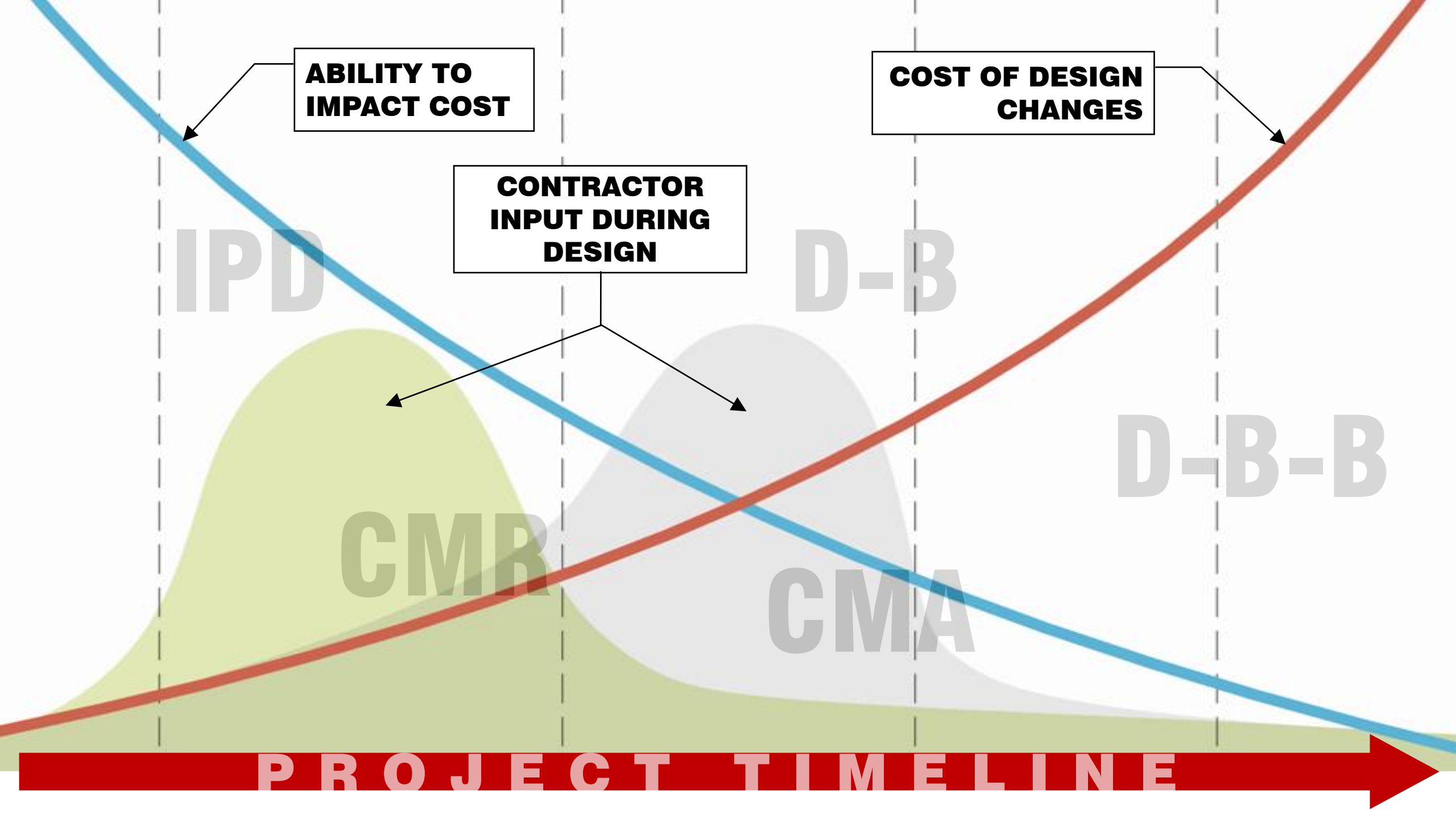
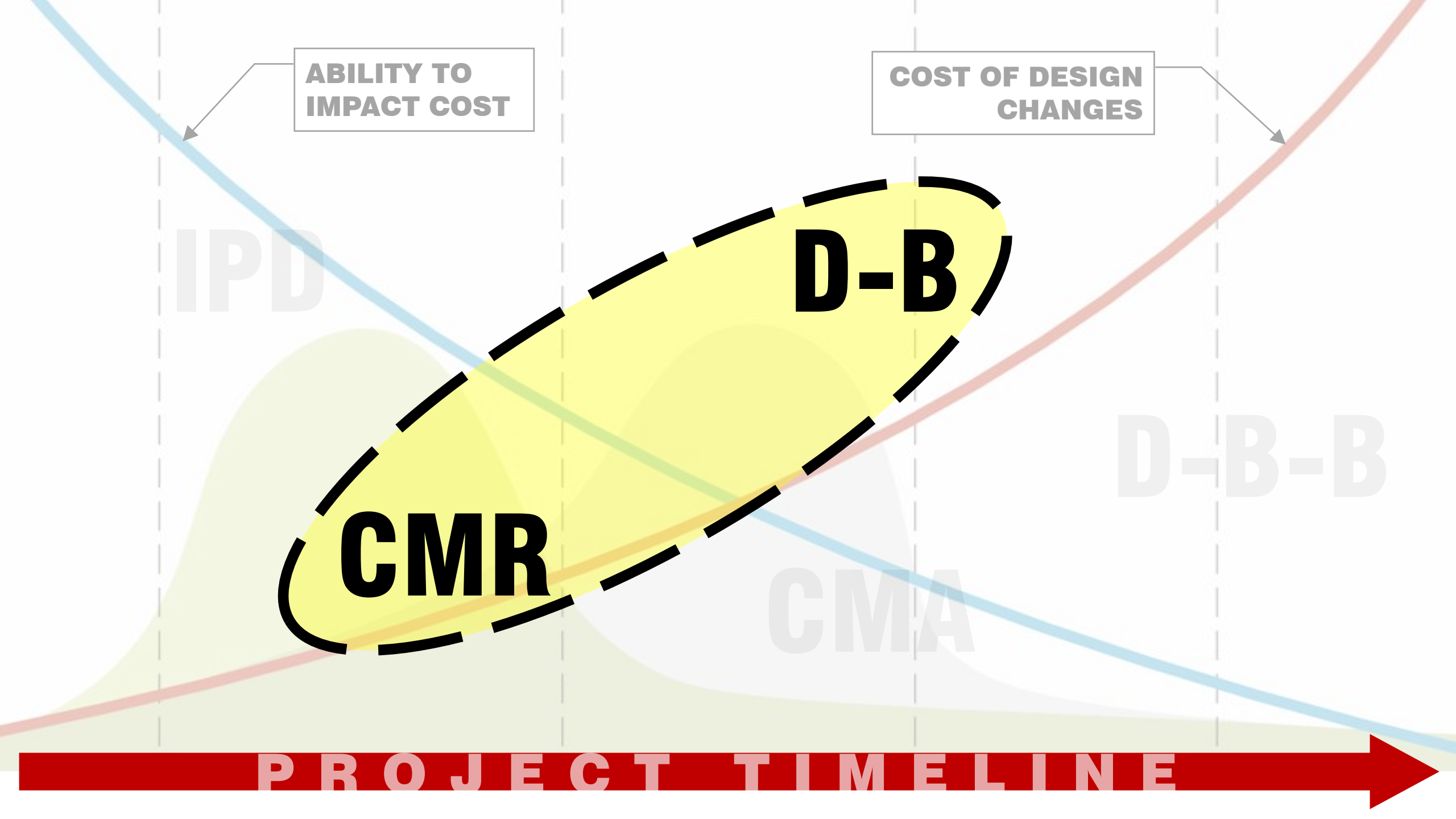

ABILITY TO IMPACT COST
COST OF DESIGN CHANGES
CONTRACTOR INPUT DURING DESIGN
IPD
D-B
D-B-B
CMR
CMA
PROJECT TIMELINE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DELIVERY METHODS - ANALYSIS

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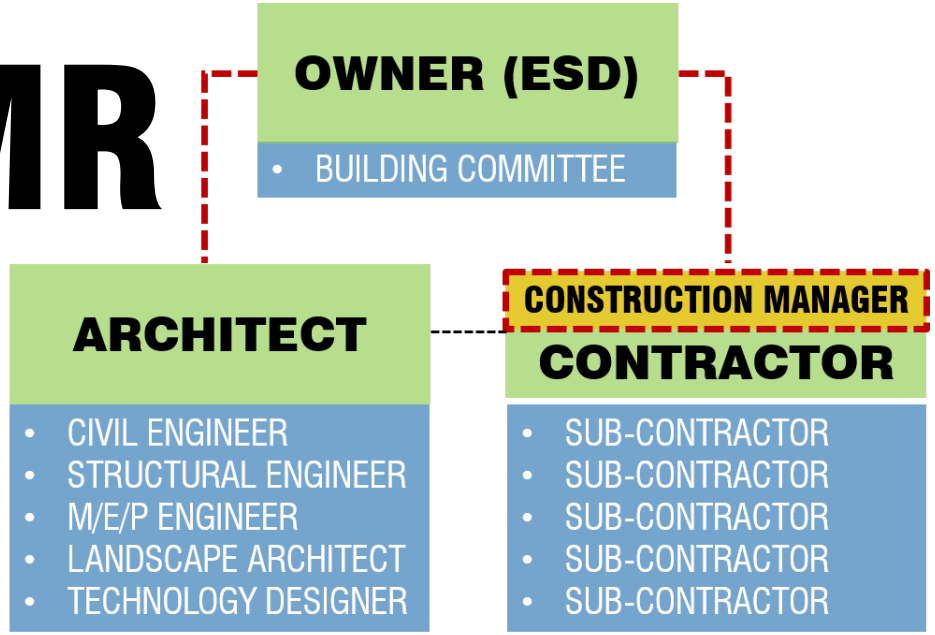

Primary Reason to Choose

- **Guaranteed Maximum Price**
- CMR provides input during Design
- **Collaborative Team Environment**

Disadvantages

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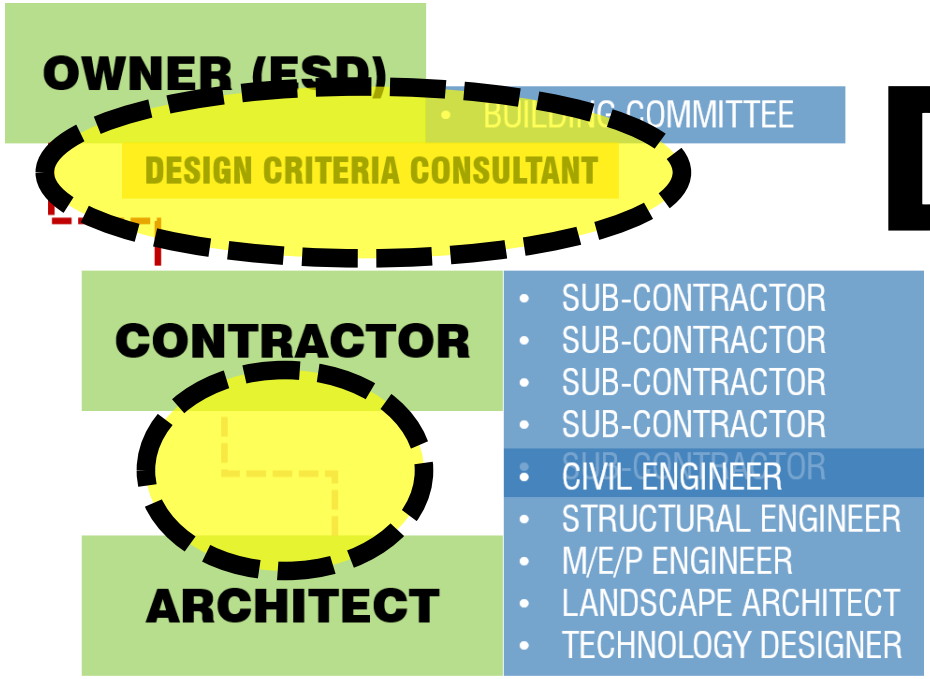
- **CMR may retain some project savings**

D-B



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Disadvantages

- **Unclear role of Design Criteria Consultant**
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- **Builder selected by Qualifications only**


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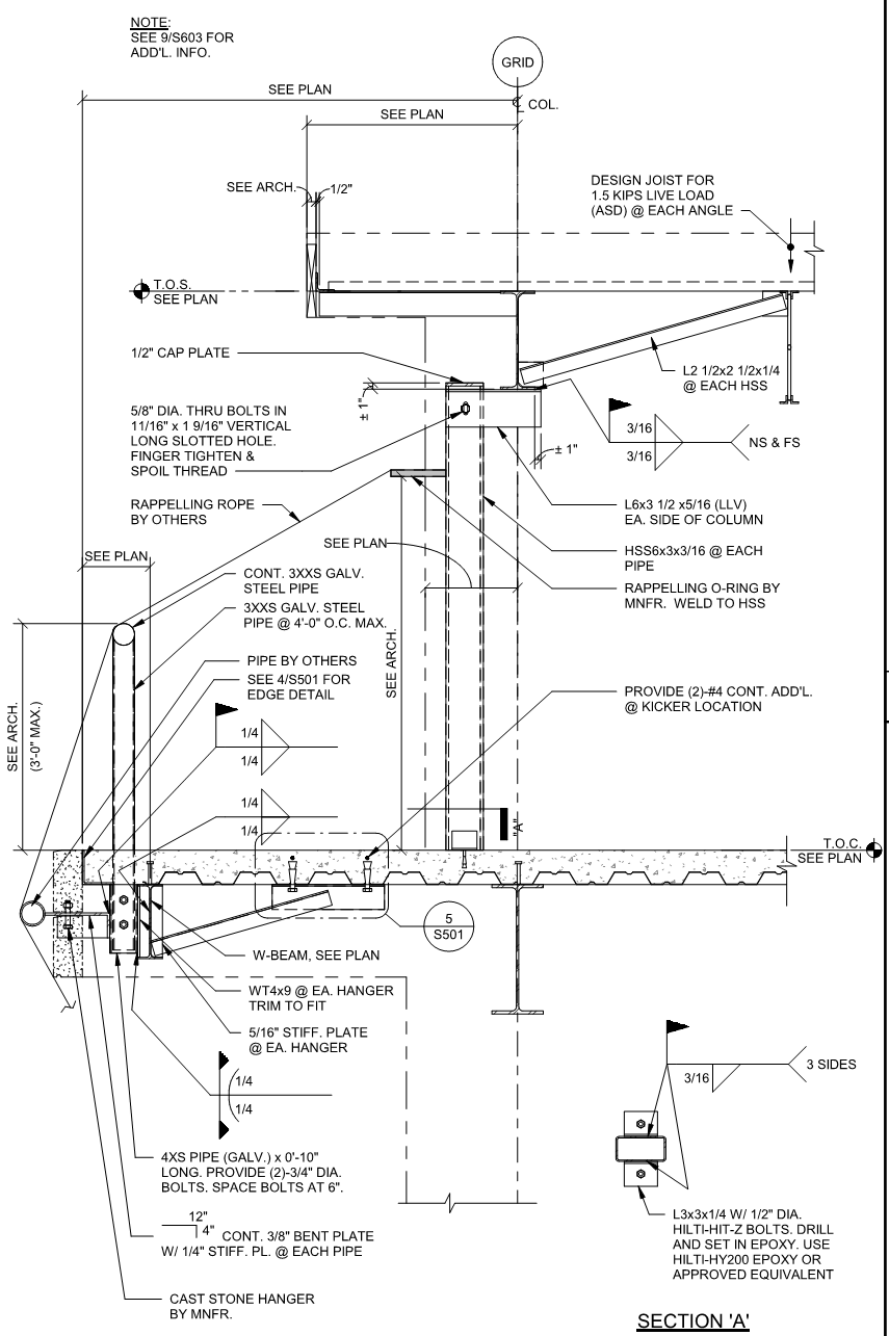
DESIGN-BUILD & CM-@-RISK

METAL BUILDING VS. ENGINEERED STEEL

HIP ROOF

GABLE ROOF

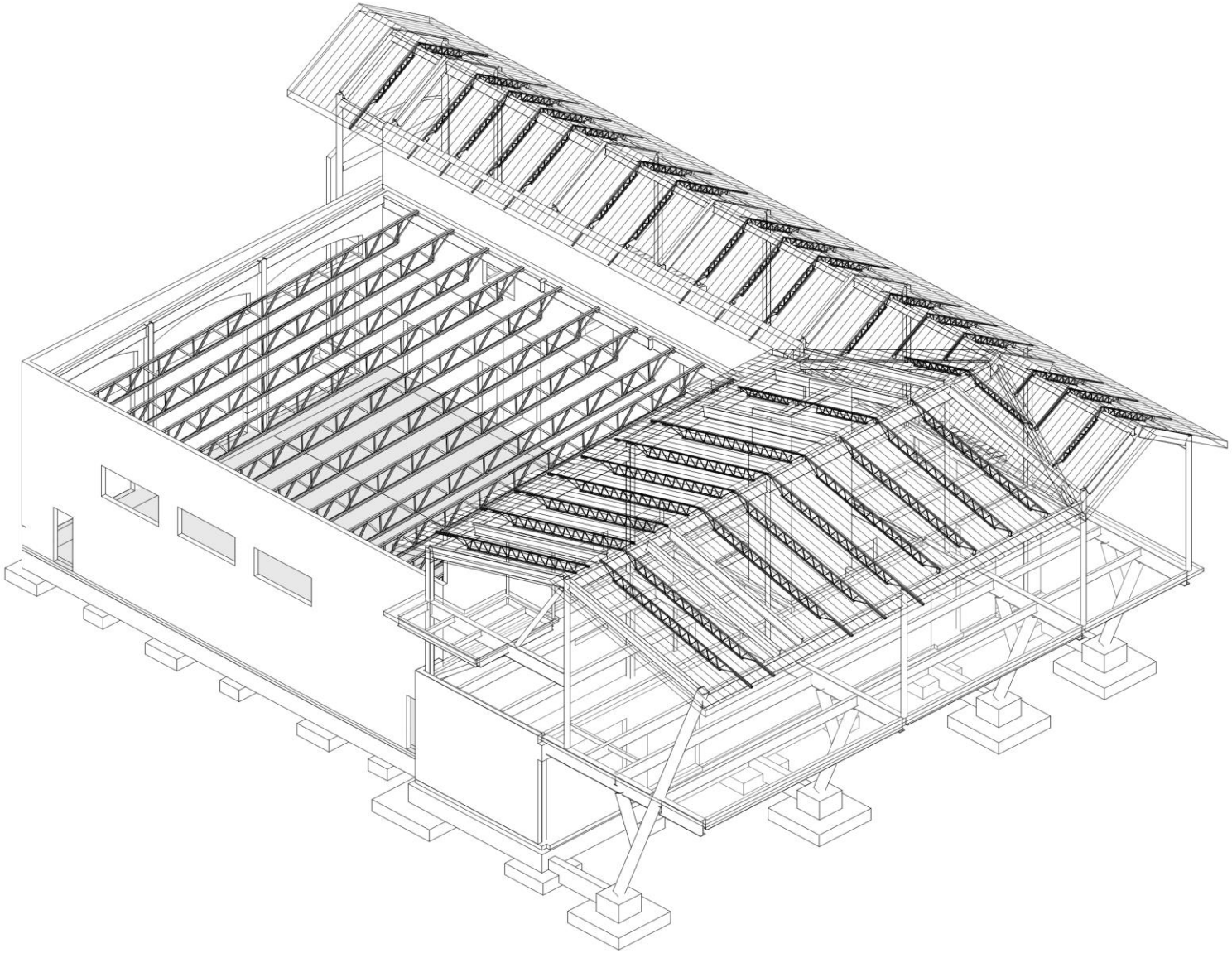


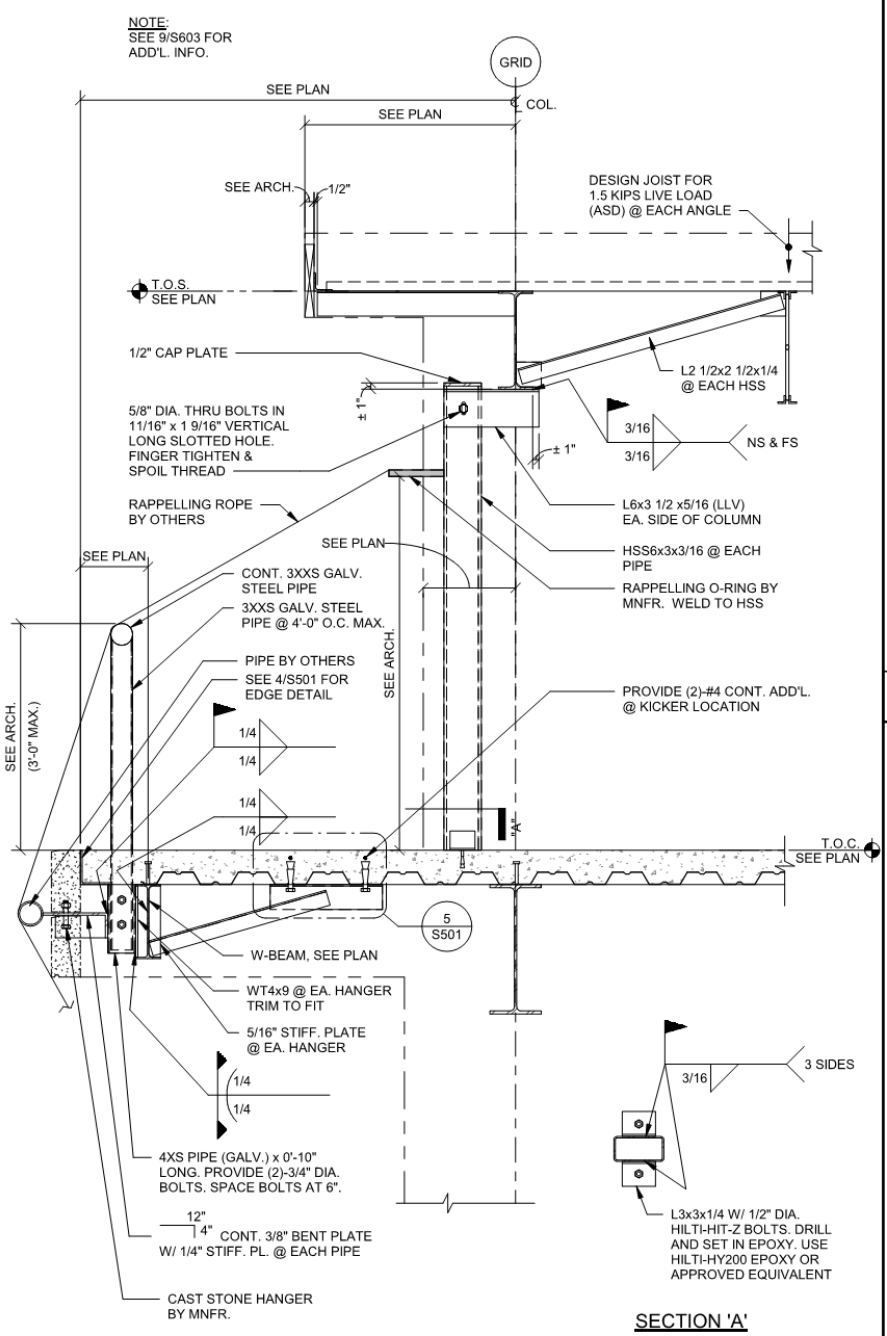
TYPICAL DETAIL AT HANDRAIL AT RAPPELLING LEVEL

11

SCALE: 3/4" = 1'-0"

METAL BUILDING VS. ENGINEERED STEEL



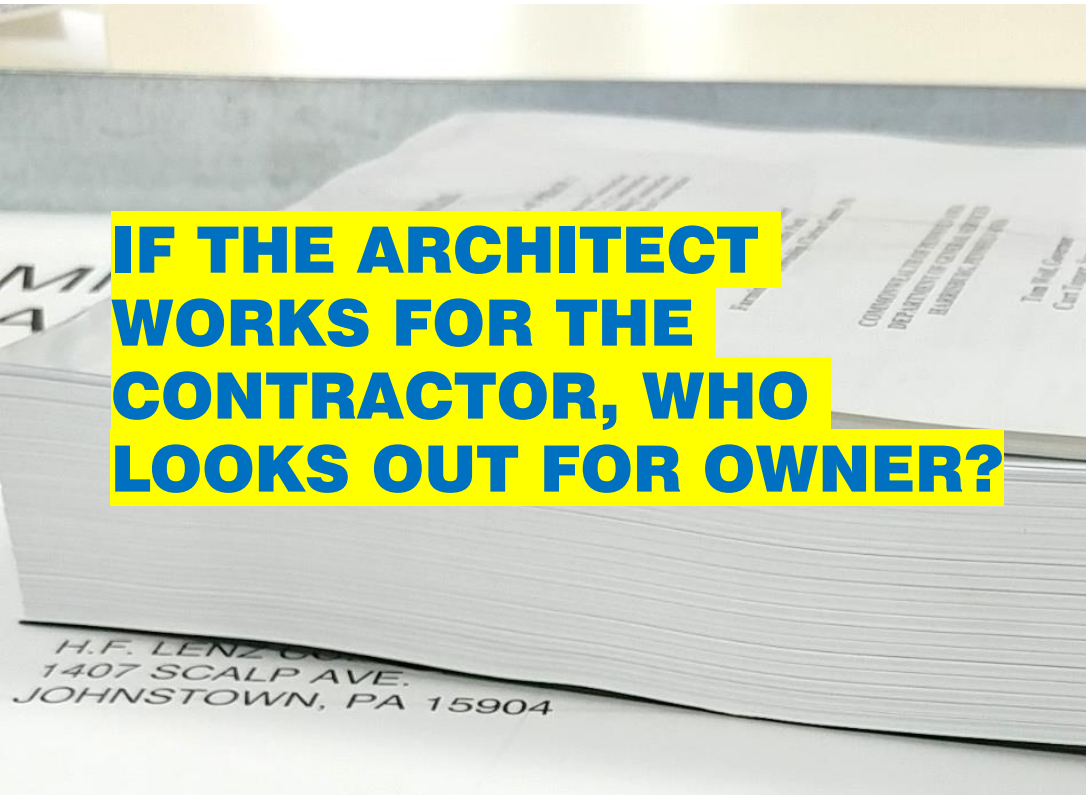


11

TYPICAL DETAIL AT HANDRAIL AT RAPPELLING LEVEL

SCALE: 3/4" = 1'-0"

PROJECT MANUAL VS. GENERAL NOTES



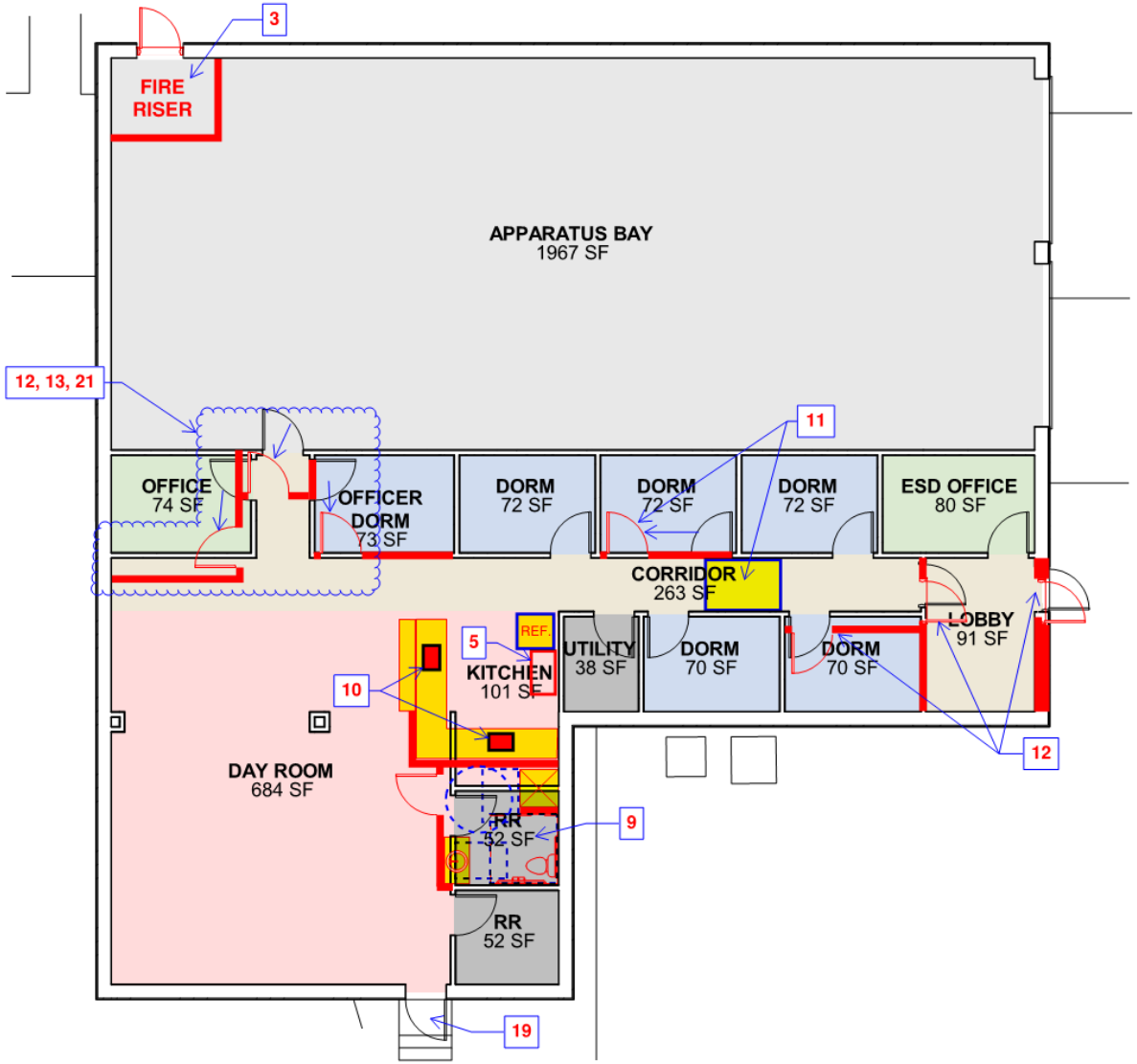
1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Building Codes:
      a. Meet requirements for NFPA 101 Class A roof assembly.
      b. Roof system will meet requirements of all federal, state, and local codes having jurisdiction.
   2. Fall Protection: Meet requirement of fall protection as required by federal, state, and local codes having jurisdiction.
   3. Fire Characteristics:
      a. Provide shingles and related roofing materials with fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency:
         1) Exterior Fire-Test Exposure: Class A; UL 790, CAN/ULC-S102, or ASTM E108, for application and roof slopes indicated.
            a) Materials shall be identified with appropriate markings of applicable testing agency.
   4. Impact Resistance:
      a. Meet UL 2218 impact resistant testing.
      b. Meet UL 2218 Class 4 impact resistant rating for hail.
   5. Wind Resistance:
      a. Meet ASTM D3161/D3161M for wind resistance.
         1) Installation shall comply with IBC Table 1507.2.7, 'Attachment'.
   6. Wind Speed:
      a. As required to meet local codes having jurisdiction.
   7. Wind Uplift Resistance:
      a. Meet UL 580 wind uplift of roof assemblies.
      b. Meet UL 1897 uplift test for roof covering systems.
      c. Meet ASTM D7158/D7158M for wind resistance for uplift force/uplift resistance.

SHEET NAME	NUMBER	SHEET NAME	NUMBER
NTATION CONTROL PLAN-	--	H.V.A.C. CONSTRUCTION CONTRACT NO. DGS 191-45 PHASE 1.2	---
TATION CONTROL	M-001	SYMBOLS, ABBREVIATIONS AND GENERAL NOTES MECHANICAL	P-001
TION CONTROL	M-201	FIRST FLOOR PLAN- MECHANICAL	P-201
	M-202	BASEMENT PLAN AND ROOF PLAN- MECHANICAL	P-202
ON CONTROL	M-301	FIRST FLOOR PLAN-RADIANT PIPING	P-203
	M-302	BASEMENT PLAN- RADIANT PIPING	P-601
LS	M-501	DIAGRAMS- MECHANICAL	

PLUMBING CO
PHASE 1.3
SYMBOLS, A
PLUMBING
FIRST FLO
BASEMEN
ROOF PI
DETAIL

ACCESSIBILITY & FIRE CODE COMPLIANCE



CONSTRUCTION MATERIALS TESTING

Slump, in.:	3 1/2	**Specification:**	-	**Concrete Temperature, ° F:**	85
Air Content, %:	1.1	**Specification:**	-	**Air Temperature, ° F:**	78
Unit Weight, pcf:	-	**Specification:**	-	**Set No.:**	1 of 2
Required Strength:	3000	**psi at 28 days**		**Curing Method:**	Water Tanks

Compressive Strength Test Method

Sample No.	Date Tested	Age Tested, days	Total Load, lb	Average Diameter, in.	Surface Area, $in.^2$	Compressive Strength, psi	Type of Fracture	Tested By
1A	10/17/19	7	42,570	6.02	28.46	1500	5	DL
1B	11/7/19	28	52,870	6.02	28.46	1860	6	DL
1C	11/7/19	28	61,830	6.02	28.46	2170	6	DL
1D	12/5/19	56	65,580	6.02	28.46	2300	6	DL

Cylinder Size: ☑ 6 x 12 ☐ 4 x 8 ☐ 3 x 6

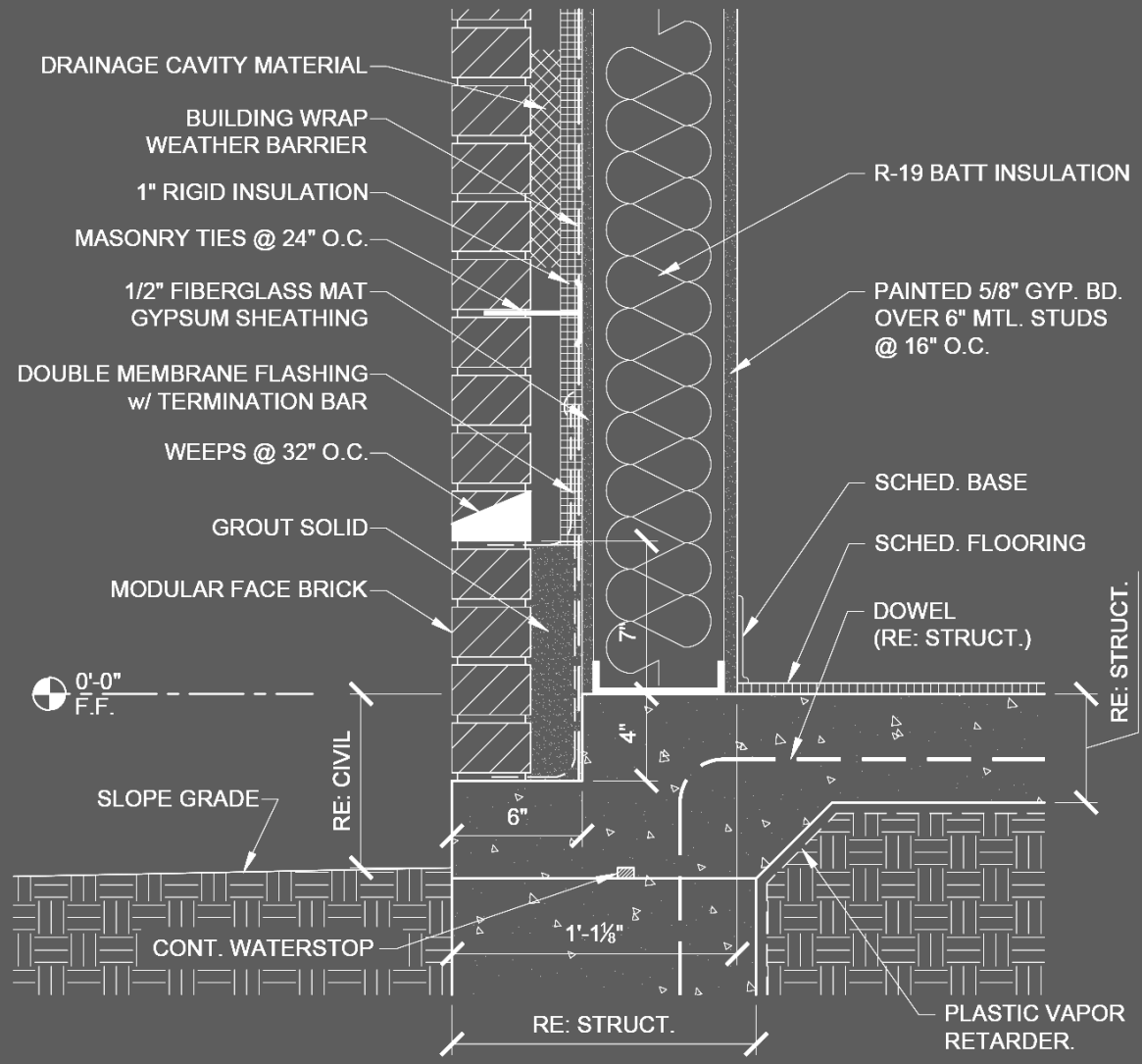
ENERGY CODE COMPLIANCE

Design Implementations

- Continuous Rigid Insulation @ all Building Envelope
- Dedicated Outdoor-air Pre-treatment Unit
- Air-duct Insulation R-8

Long-term Cost-Benefit Analysis

- Energy Savings
- Longer Equipment life (not working as hard)
- Improved Occupant Health



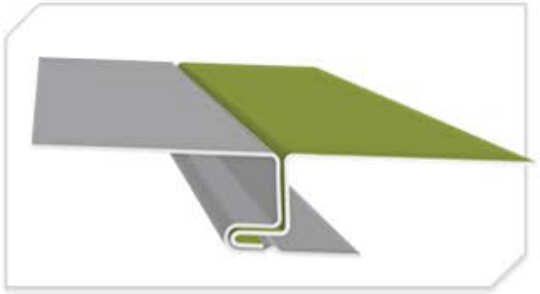
2 LEDGE: BRICK @ MTL. STUDS

SCALE: 1 1/2" = 1'-0"

METAL SLOPED ROOF SYSTEMS

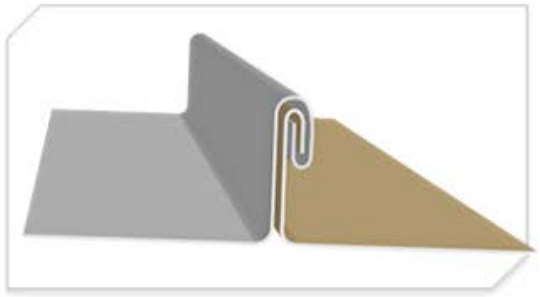
METAL SLOPED ROOF SYSTEMS

ENGINEERED METAL ROOFING SYSTEMS

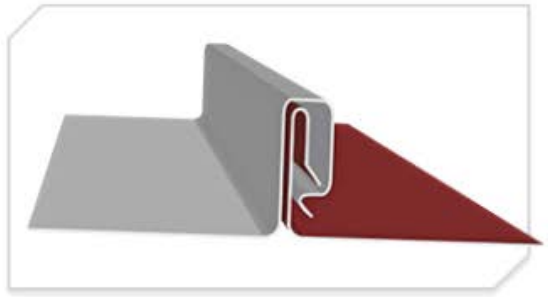


SMI 1.0 FWP with HEM

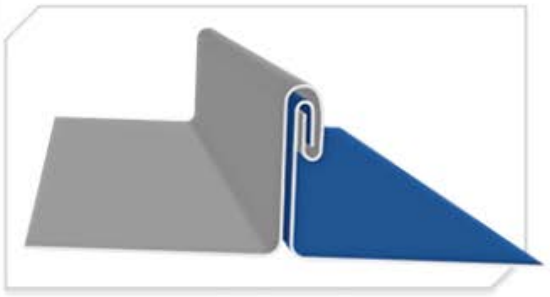
SMI 1.5 SL 550



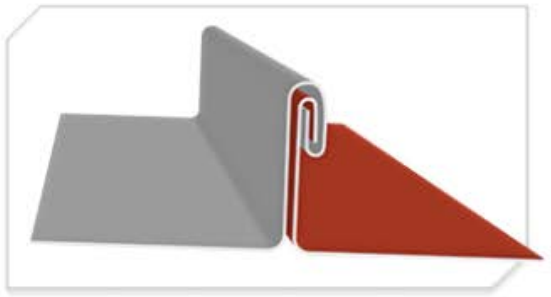
SMI 1.5 MS



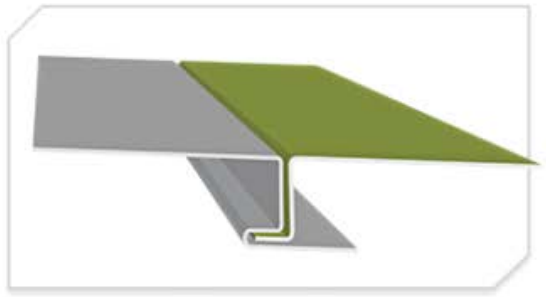
SMI 1.75 SL



SMI 2.0 MS

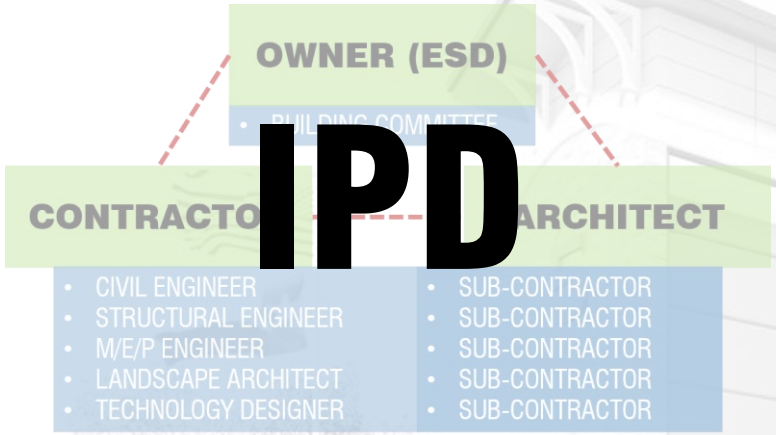


SMI 2.0 SCH MS



SMI 1.0 FWP

DELIVERY METHODS - ANALYSIS



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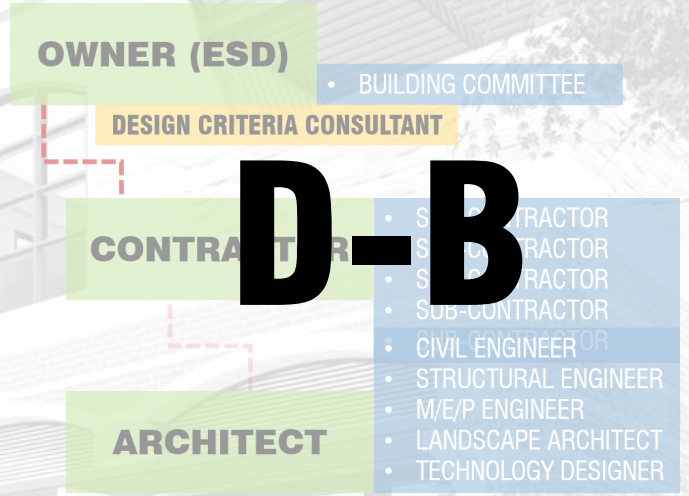
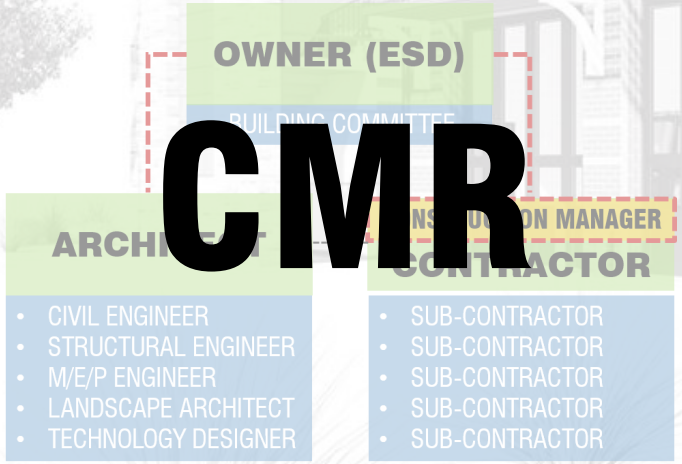
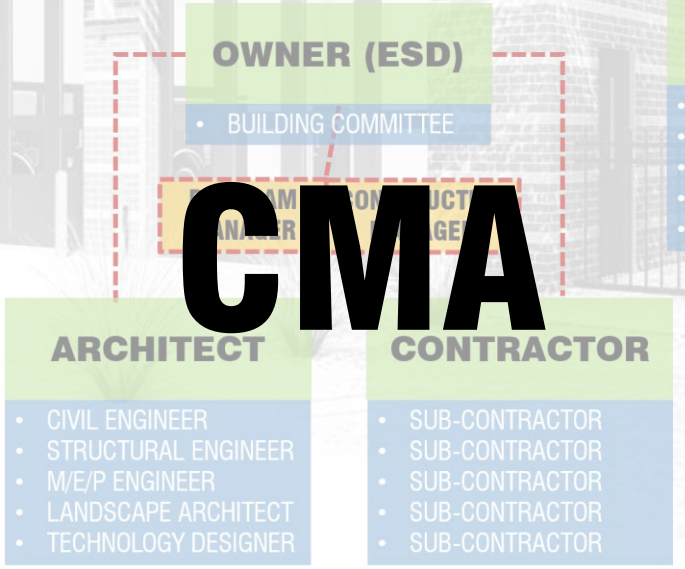


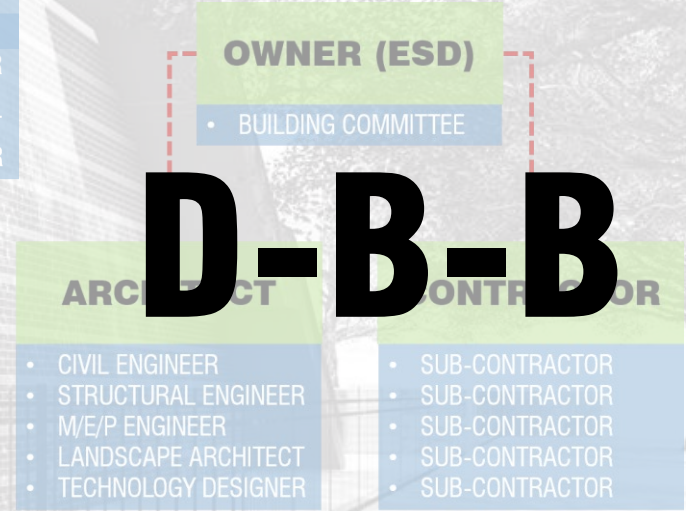
D-B



CMR



CMA



D-B-B


FIRE DEPARTMENT
ADMINISTRATION
FIRE STATION
6