



Commercial Reach Code Proposal Application

Department of Consumer & Business Services

Building Codes Division

1535 Edgewater NW, Salem, Oregon

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Oregon.gov/bcd

Read the entire code amendment proposal application before completing this form. Please complete all parts before submitting your proposal and refer to the provided checklist.

APPLICANT INFORMATION

Name:	Date:	
Representing (if applicable):	Phone:	
Mailing address:		
City:	State:	Zip:
Email address:		

PROPOSAL INFORMATION

Code section(s):
Briefly explain the subject of your proposal:

INSTRUCTIONS AND CHECKLIST

Fill in all the information above and submit this page with the required supplementary information for Parts I and II. This application may be submitted by mail to the mailing address above or by email to bcd.ptsptech@dcbs.oregon.gov.

- ☐ **Part I Code language**
You must provide exact language for your code proposal. Include all code sections that require changes and use the following format to show additions and deletions from the code:

Underline for added text

~~Strikethrough~~ for deleted text

- ☐ **Part II Commercial Reach Code proposal criteria**
Provide responses to the criteria questions on page 2 of this application.

Note: One application is required for each code section you are proposing to amend. If this proposal requires changes in other sections of the code for alignment, include those changes as part of this application.

APPLICANT SIGNATURE

Signature: 	Date:
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Copyright notice: By signing this Code Amendment Proposal Application, I understand and acknowledge that the work contained in this application is original, or if not original, I have the right to copy the work. By signing this work, I understand that any rights I may have in this work, including any form of derivative works and compilations, are assigned to the Department of Consumer and Business Services Building Codes Division. I also understand that I do not retain or acquire any rights once this work is used in a Department of Consumer and Business Services Building Codes Division publication.

COMMERCIAL REACH CODE PROPOSAL CRITERIA

1. Describe the concept and purpose of this proposal.
2. Does this proposal increase efficiency over the Oregon Energy Efficiency Specialty Code energy provisions? If so, explain how and provided any supporting documentation.

Helpful information to include

- a) How many incremental MBtus will be saved annually?
- b) What is the associated annual energy cost savings?

3. What is the fiscal impact of this proposal?

Helpful information to include

- a) What is the fiscal impact to the end consumer?
- b) What is the fiscal impact to the builder/contractor?
- c) What is the simple payback of the fiscal impact when considering the annual energy savings?
- d) What is the life-cycle cost, if available?

4. It is important that proposals be shared with stakeholders that will be impacted by them. Was this proposal developed with people or organizations likely to be affected by it? Has it been reviewed or shared with people or organizations likely to be affected by it? If so, who, and if not, why not?

APPLICATION REVIEW

If you submit completed proposed code amendments to the division before the end of the timetable established in the proposal notice the division will forward them to the appropriate advisory board for review. The division will not forward proposed code amendments that are not completed before the end of the timetable.

Part I: Proposed Code Language for Oregon Commercial Reach Code – Addendum M Compliance Path

Introduction

This document fulfills the requirements of Part I of the Commercial Reach Code Proposal Application. It provides the exact proposed code language for the Net Zero Addendum M Method as an alternate compliance path in the Oregon Commercial Reach Code. Additions and deletions are formatted as required, with underlines for added text and strikethroughs for removed text. The proposed language is designed to align with ANSI/ASHRAE/IES Standard 90.1 Appendix M, Section M3.1.

Proposal Information

Code Section: New Section CR1301.3.3 Net Zero Addendum M Method

1. Concept and Purpose of the Proposal: Add net zero operational emissions (Appendix M to ASHRAE 90.1-2022) alternate compliance path on the same level as the Energy Cost Budget Method and Appendix G Method as being sufficient to demonstrate energy code compliance. Appendix M is offered as a plug-in jurisdictional compliance pathway for those adopting ASHRAE 90.1-2022.

2. Increase in Efficiency: PNNL, Commercial Zero Code Plug-In: Zero Energy and Operational Emissions Overlay for Model Energy Codes Technical Brief March 2024
“The code-cycle 1 efficiency backstop is equivalent to reducing regulated energy use by one half that achieved with the advanced measures relative to Standard 90.1-2022. The improvements result in approximately an 11.5% reduction in total energy use compared to ASHRAE Standard 90.1-2022 values”

Table 1. Example Calculation of the Site Performance Energy Index

NZOEE PEI _{site} Compliance	Case 1a	Case 1b	Case 2a	Case 2b
	Med Office 4A Mixed Fuel	Med Office 4A All-Electric	Med Office 4A Mixed Fuel	Med Office 4A All-Electric o
Building Performance Factor (BPF)	0.34			
Baseline Building Energy Use Site (kBtu/ ft ² yr)	49.7			
Baseline Building Regulated Energy Use (kBtu/ ft ² yr)	39.4			
Baseline Building Unregulated Energy Use (kBtu/ ft ² yr)	10.3			
Code Cycle 1 PEI _{site,target} (kBtu/ ft ² yr)	0.48			
Proposed Building Gross Energy Use (kBtu/ ft ² yr)	23.7			
Proposed Building PEI _{site}	0.48			
PEI _{site} ≤ PEI _{site,t}	Yes			

3. Fiscal Impact of the Proposal: The Fiscal Impact of the Proposal is TBD. However, preliminary insights from the Stretch Code analysis indicate potential cost increases of 2-3% for the first costs. Operational savings are expected to offset these investments over the buildings' lifecycles. Based on similar code trends, the payback period for operational savings is estimated to range from 5 to 10 years, depending on building typology and scale.

4. Stakeholder Involvement and Review: Yes, the proposal has been reviewed and endorsed by the ZERO coalition technical and policy committee, consisting of industry professionals across Oregon. In addition, Addendum M underwent a multi-year review process at ASHRAE. Its adoption as an Informative appendix originated in the Energy Cost Budget Subcommittee and was recommended for public review. After multiple rounds of review open to the general public, it was approved by the 90.1 Standards Committee. This wide range of vetting and support underscores the proposal's technical feasibility.

5. Proposal Code Text: The following section provides the proposed code language changes. New additions are underlined, and deletions are formatted as strikethrough to ensure compliance with Part I submission requirements.

CR1301.3 Application. New buildings, other than *data centers*, shall comply with the 2021 OEESC and either Section CR1301.3.1, ~~or~~ CR1301.3.2, or CR1301.3.3. *Data centers* shall comply with the 2021 OEESC, using Standard 90.1 Section 4.2.1.1, Item a. and Section CR1301.3.3.

CR1301.3.1 Energy Cost Budget Method. Comply with Standard 90.1 Section 4.2.1.1., Item b., *Energy Cost Budget Method* (Chapter 11), modified by the following: The *design energy cost* shall be less than 90% of the *energy cost budget*.

CR1301.3.2 Appendix G Method. Comply with Standard 90.1 Section 4.2.1.1, Item c., *Performance Rating Method* (Appendix G), to achieve a 10% reduction of regulated energy use. The Performance Cost Index Target (PCIt) formula is modified as follows:
$$PCIt = [BBUEC + (BPF \times 0.90 \times BBREC)] / BBP$$

CR1301.3.3 Net Zero Addendum M Method. Comply with ANSI/ASHRAE/IES Standard 90.1, Appendix M, Section M3.1.

6. Closing: This document is submitted as Part I of the Commercial Reach Code Proposal Application. It includes the exact language necessary to integrate the Net Zero Addendum M Method into the Oregon Commercial Reach Code. As required by the application guidelines, all additions are underlined, and deletions are strikethrough.

7. Referenced Standards and Supporting Documents:

- ANSI/ASHRAE/IES Standard 90.1 Appendix M: Provides a jurisdictional plug-in compliance pathway to achieve net-zero operational emissions.
- Pacific Northwest National Laboratory (PNNL) Technical Brief on Commercial Zero Code Plug-In (March 2024): Details the technical and efficiency improvements enabled by Appendix M.

Part II: Commercial Reach Code Proposal Criteria – Net Zero Appendix M Compliance Path

Introduction

This document fulfills the requirements of Part II of the Commercial Reach Code Proposal Application. It evaluates the Net Zero Appendix M Method as an alternate compliance path for the Oregon Commercial Reach Code. This section addresses the criteria for efficiency improvements, fiscal impact, and stakeholder involvement, providing detailed financial insights and referencing established analysis from the Massachusetts Stretch Code as a comparable framework. By integrating this method, the proposal supports Oregon's objectives to enhance energy efficiency and achieve net-zero operational emissions.

1. Describe the concept and purpose of this proposal.

This proposal introduces the Net Zero Appendix M Method as an alternate compliance path for the Oregon Commercial Reach Code. The method aligns with ANSI/ASHRAE/IES Standard 90.1 Appendix M, Section M3.1 and offers a scalable and performance-based pathway to achieve net-zero operational emissions. By providing flexibility for compliance, the proposal encourages adoption of advanced energy standards while supporting Oregon's broader goals of decarbonization, energy efficiency, and sustainability.

2. Does this proposal increase efficiency over the Oregon Energy Efficiency Specialty Code energy provisions? If so, explain how and provide any supporting documentation.

Yes, the Net Zero Appendix M Method results in substantial efficiency improvements. According to a technical brief by the Pacific Northwest National Laboratory (PNNL), Appendix M measures achieve an approximate 11.5% reduction in total energy use compared to ASHRAE Standard 90.1-2022 values. This compliance path focuses on reducing regulated energy use, integrating renewable energy systems, and optimizing operational performance.

Incremental MBtus saved annually are expected to align with PNNL projections but will depend on Oregon-specific modeling. Associated energy cost reductions are consistent with trends observed in the Massachusetts Stretch Code. This code serves as a benchmark due to its alignment with similar advanced energy measures and efficiency goals.

3. What is the fiscal impact of this proposal?

Preliminary insights from the Massachusetts Stretch Code analysis that were used to inform the Municipal opt-in Specialized Code requirements indicate potential first-cost increases of approximately 2-3% for implementing optimized energy pathways. For example, the following costs were identified in the analysis for a 652,800 SF office high-rise:

- **First Costs:**
- Base Case 40% Vision (Gas Heat): \$10,152,869 total, or \$15.55/SF.
- Optimized 50% Vision (Gas Heat): \$10,407,869 total, or \$15.94/SF.
- The Optimized 50% Vision represents a 2.5% increase in upfront costs compared to the Base Case.

The operational savings and payback periods will depend on Oregon-specific building typologies and energy rates. However, this Massachusetts Stretch Code analysis indicates that lifecycle cost savings from reduced utility expenses and improved efficiency outweigh the initial investments.

**4. Was this proposal developed with people or organizations likely to be affected by it?
Has it been reviewed or shared with them?**

Yes, this proposal has been reviewed and endorsed by the ZERO Coalition's technical and policy committee, which includes industry professionals, policymakers, and environmental advocates across Oregon. Additionally, Appendix M underwent a multi-year review process at ASHRAE, including multiple rounds of public review before being approved by the 90.1 Standards Committee. This extensive vetting underscores the proposal's technical feasibility and broad stakeholder support.



Massachusetts Department of Energy Resources

STRETCH CODE STUDY

**SUBMITTED TO:**

Steven Winter Associates, Inc.
Paula Zimin
307 Seventh Ave, Suite 1701
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SUBMITTED BY:

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72 Sumner Street
Milford, MA 01757

June 11, 2021



CONSIGLI
Est. 1905

TABLE OF CONTENTS

MA DOER Stretch Code Study



Established, Stable, Proven Partner

Challenging projects are best navigated with an established, stable, proven partner. As a 116-year old family-led company with deep roots in our communities, Consigli remains true to what we do best—executing on great projects—while introducing new protocols to keep our people, partners and communities safe and informed. Our adaptability to change partnered with a nimble and tenured leadership team ensures Consigli can offer a level of predictability that will minimize your risks and give you certainty of outcome.

1. Assumptions & Qualifications
2. Office High Rise
3. Office/Lab
4. Small Office
5. Primary School
6. Secondary School

ASSUMPTIONS & QUALIFICATIONS

ASSUMPTIONS & QUALIFICATIONS

MA DOER STUDY

CONCEPT ESTIMATE

JUNE 11, 2021



Pricing and scope developed in the attached documentation are based exclusively on the narratives provided, which describe theoretical buildings of simple geometry. These buildings are not necessarily reflective of practical realities faced by owners, designers, and contractors, which should be taken into consideration when consuming these costs. We have provided details of cost derivation for only a narrow set of variables explicit in the narrative. However, we have provided full project construction cost as a baseline cost for each project prototype to put the variables into context. These baseline costs are based solely on \$/SF and derived from our collective experiences. They are not based on any one project and are not based on quantity takeoffs since detailed prototype designs are not part of this study.

The below notes are intended to clarify our understanding of narrative and prototype scopes and identify assumptions we've made where information is not explicit within the narratives.

GENERAL

1. Pricing is based on narratives from SWA (undated) received 4/15/21.
2. The delta's presented between base/Passive house/optimized are representative of scope detailed in the documentation provided. Additional scope discrepancies that may be part of a more complex building (ex. Water reclaim systems, solar arrays, renewable material selections) are not represented in the deltas between options.
3. Pricing is based on today's dollars. Escalation is excluded.
4. Pricing includes construction costs only. Design fees, consulting fees, FF&E, and all other 'soft' costs excluded.
5. Costs related air tightness are limited to anticipated costs for whole building air leakage testing. We include testing at 15k as provided by SWA, for each prototype and option requiring it in the narrative. Additionally, we have assigned a \$/SF for the contractor's scope required to prepare for the testing, but we have limited historical data to support these costs. We have made no distinction in cost and scope to construct the building envelopes, other than door gasketing and hardware upgrade allowances, as there is no indication of the scope required to achieve specified air tightness.
6. Changes in weight of envelope are assumed to have no change on the buildings structural design.
7. The following pre-fixes are used in the below assumptions & qualifications:
 - BC – Base Case
 - OPT – Optimized
 - PH – Passive House
8. Thermal pads at window perimeters are not include for any options/typologies, per direction from SWA.

OFFICE HIGHRISE

ARCHITECTURAL/STRUCTURAL

1. Pricing includes core and shell only. TI is excluded.
2. Façade is included as curtain wall for 100% of the building, except for the mechanical penthouse which is assumed to be a combination of metal panels and louvers.
3. Pricing includes Core & Shell only.
4. Floor to floor heights assumed 13'0" for floors 2-15, 20'0" for the entry level, and 16'0" for the penthouse.
5. Vision glass is included as follows:
BASE CASE – 40% vision (U-0.30)

ASSUMPTIONS & QUALIFICATIONS

MA DOER STUDY

CONCEPT ESTIMATE

JUNE 11, 2021



- 1" IGU
- One low-e surface

BASE CASE – 50% vision (U-0.25)

- 1" IGU
- One low-e surface
- Argon filled cavity

OPTIMIZED – 40% vision (U-0.25)

- 1" IGU
- One low-e surface
- Argon filled cavity

OPTIMIZED – 50% vision (U-0.20)

- 1" IGU
- Two low-e surfaces
- Argon filled cavity

PASSIVE HOUSE– 40% vision (U-0.13)

- Triple pane IGU
- Three low-e surfaces
- Argon filled cavities

PASSIVE HOUSE– 50% vision (U-0.13)

- Triple pane IGU
- Three low-e surfaces
- Argon filled cavities

MEP

6. Pricing includes core and shell only. TI is excluded as directed. However, it is important to note that cost deltas between options for core/shell may be largely mitigated by the scope required for distribution and terminal equipment for the tenant fit out.
7. BC - VAV's are included (1/1000sf) for 15% of total building SF
8. BC – Includes finned tube radiation. This will contribute to a lower tenant fit out cost and terminal equipment for the other options is limited to the core/shell areas only.
9. OPT – Aeroseal is not included.
10. PH – Aeroseal is included for core and shell ductwork. (core/shell duct included @ 0.35lbs/SF and surface area of internal duct calculated @ 65% of lbs.)
11. OPT(elec)/PH(elec.) - 810 tons of cooling removed from chiller plant.
12. OPT/PH - FCUs are included (1/1500sf) for 15% of total building SF.

ASSUMPTIONS & QUALIFICATIONS

MA DOER STUDY

CONCEPT ESTIMATE

JUNE 11, 2021



OFFICE/LAB HIGHRISE

ARCHITECTURAL/STRUCTURAL

1. Pricing includes core and shell only. TI is excluded.
2. Façade is included as curtain wall for 100% of the building, except for the mechanical penthouse which is assumed to be a combination of metal panels and louvers.
3. Floor to floor heights assumed 15'0" for floors 2-9, 20'0" for the entry level, and 16'0" for the penthouse.
4. Pricing includes Core & Shell only.
5. Vision glass is included as follows:

BASE CASE – 40% vision (U-0.30)

- 1" IGU
- One low-e surface

BASE CASE – 50% vision (U-0.25)

- 1" IGU
- One low-e surface
- Argon filled cavity

OPTIMIZED – 40% vision (U-0.25)

- 1" IGU
- One low-e surface
- Argon filled cavity

OPTIMIZED – 50% vision (U-0.20)

- 1" IGU
- Two low-e surfaces
- Argon filled cavity

PASSIVE HOUSE– 40% vision (U-0.13)

- Triple pane IGU (achieving U-.13 as discussed and not U-.11 per narrative)
- Three low-e surfaces
- Argon filled cavities

PASSIVE HOUSE– 50% vision (U-0.13)

- Triple pane IGU (achieving U-.13 as discussed and not U-.11 per narrative)
- Three low-e surfaces
- Argon filled cavities

MEP

6. Pricing includes core and shell only. TI is excluded as directed. However, it is important to note that cost deltas between options for core/shell may be largely mitigated by the scope required for distribution and terminal equipment for the tenant fit out.
7. BC - VAV's are included (1/1000sf) for 15% of total building SF
8. BC – Includes finned tube radiation. This will contribute to a lower tenant fit out cost and terminal equipment for the other options is limited to the core/shell areas only.
9. OPT – Aeroseal is not included.

ASSUMPTIONS & QUALIFICATIONS

MA DOER STUDY

CONCEPT ESTIMATE

JUNE 11, 2021



10. PH – Aero seal is included for core and shell ductwork. (core/shell duct included @ 0.35lbs/SF and surface area of internal duct calculated @ 65% of lbs.)
11. OPT(elec)/PH(elec.) - 510 tons of cooling removed from chiller plant.
12. OPT/HP - FCUs are included (1/1500sf) for 15% of total building SF.

SMALL OFFICE

ARCHITECTURAL/STRUCTURAL

13. Floor to floor heights assumed 13'0".
14. Pricing includes full interior fit-out.
15. No skylights included; referenced in narrative section B.iii, but not shown in the Envelope Systems chart.

MEP

16. BC/OPT(gas)/PH(gas) - Constant volume boxes are included (1/1000sf).
17. OPT(elec)/PH(elec) – 23 VRF units are included.
18. PH – Aero seal is included for all ductwork. (core/shell duct included @ 1lbs/SF and surface area of internal duct calculated @ 65% of lbs.)

PRIMARY SCHOOL

ARCHITECTURAL/STRUCTURAL

19. Operable windows assumed 20 sf/ea for the purposed of quantifying and applying cost premiums to fixed windows (applied to 35% of the glazed area as noted in the narrative).

MEP

20. BC/OPT(gas)/PH(gas) – VAV boxes are included (1/750sf).
21. OPT(elec)/PH(elec) – 96 VRF units are included.
22. PH – Aero seal is included for all ductwork. (core/shell duct included @ 1lbs/SF and surface area of internal duct calculated @ 65% of lbs.)

SECONDARY SCHOOL

ARCHITECTURAL/STRUCTURAL

23. Operable windows assumed 30 sf/ea for the purposed of quantifying and applying cost premiums to fixed windows (applied to 35% of the glazed area as noted in the narrative).

MEP

24. BC – VAV boxes are included (1/750sf).
25. OPT(gas/elec)/PH(gas/elec) – 424 FCU's units are included.
26. OPT(elec)/PH(elec.) - 294 tons of cooling removed from chiller plant.
27. PH – Aero seal is included for all ductwork. (core/shell duct included @ 1lbs/SF and surface area of internal duct calculated @ 65% of lbs.)

OFFICE HIGH RISE

MA DOER - Stretch Code Study
Office High Rise - Core & Shell Only - BASELINE COST

June 11, 2021



WBS	DESCRIPTION	Total Cost 652,800 SF	
01-10	Testing	-	\$ -
01-50	Temporary Hoist	2.75	\$ 1,795,000
01-55	Winter Conditions	1.50	\$ 979,000
01-60	Final Cleaning	0.25	\$ 163,000
03-30	Concrete	32.00	\$ 20,890,000
04-20	Masonry	2.00	\$ 1,306,000
05-12	Structural Steel - base scope	40.00	\$ 26,112,000
	Structural Steel - variable scope	-	\$ -
05-50	Miscellaneous Metals	5.50	\$ 3,590,000
06-25	Architectural Millwork/Casework	1.00	\$ 653,000
07-10	Waterproofing/Caulking	2.50	\$ 1,632,000
07-50	Roofing & Sheet Metal - base scope	1.00	\$ 653,000
	Roofing & Sheet Metal - variable scope	2.21	\$ 1,440,000
07-81	Fireproofing	2.25	\$ 1,469,000
08-10	Doors, Frames, Hardware	1.00	\$ 653,000
08-36	Overhead Doors	0.10	\$ 65,000
08-41	Façade	41.38	\$ 27,014,000
08-80	Interior Aluminum, Glass & Glazing	0.75	\$ 490,000
09-21	Drywall - base scope	10.00	\$ 6,528,000
	Drywall - variable scope	1.71	\$ 1,115,000
09-30	Tile	1.00	\$ 653,000
09-51	Acoustical Ceilings	0.20	\$ 131,000
09-54	Specialty Ceilings	0.50	\$ 326,000
09-60	Floors	1.00	\$ 653,000
09-90	Painting	1.25	\$ 816,000
10-01	Typical Specialties	0.50	\$ 326,000
10-14	Signage	0.10	\$ 65,000
10-95	Misc. Specialties	0.50	\$ 326,000
11-12	Parking Equipment		\$ -
11-24	Window Washing Equipment	0.30	\$ 196,000
11-40	Food Service Equipment		\$ -
11-95	Other Equipment	0.50	\$ 326,000
14-20	Elevators	11.00	\$ 7,181,000
21-01	Fire Protection	7.25	\$ 4,733,000
22-01	Plumbing - base scope	10.50	\$ 6,854,000
	Plumbing - variable scope	0.26	\$ 171,000
23-01	HVAC - base scope	21.00	\$ 13,709,000
	HVAC - variable scope	19.33	\$ 12,617,000
26-01	Electrical - base scope	18.50	\$ 12,077,000
	Electrical - variable scope	2.63	\$ 1,714,000
26-02	Photovoltaics	-	\$ -
31-23	Site Work	15.00	\$ 9,792,000
31-24	Piles	3.00	\$ 1,958,000
31-41	Support of Excavation (SOE)	5.00	\$ 3,264,000
32-10	Landscaping & Site Improvements	4.00	\$ 2,611,000
32-31	Fencing		\$ -
33-10	Utilities	1.50	\$ 979,000
SUBTOTAL		273	\$ 178,025,000
Indirects Costs 20.00%		54.54	\$ 35,605,000
TOTAL COST		327	\$ 213,630,000



WBS		DESCRIPTION		BASE CASE - 10% Stretch				BASE CASE - 20% Stretch				OPTIMIZED								PASSIVE HOUSE															
				40% Vision		50% Vision		40% Vision		50% Vision		40% Vision				50% Vision				40% Vision				50% Vision											
				Gas Heat		Total Cost 652,800 SF		Gas Heat		Total Cost 652,800 SF		Gas Heat		Electric Heat		Gas Heat		Electric Heat		Gas Heat		Electric Heat		Gas Heat		Electric Heat									
01-10	Testing	-	\$	-	-	\$	-	-	\$	-	-	\$	-	0.32	\$	210,840	0.32	\$	210,840	0.32	\$	210,840	0.32	\$	210,840	0.32	\$	210,840	0.32	\$	210,840				
05-12	Structural Steel	-	\$	-	-	\$	-	-	\$	-	-	\$	-	0.21	\$	138,400	0.21	\$	138,400	0.21	\$	138,400	0.21	\$	138,400	0.21	\$	138,400	0.21	\$	138,400				
07-50	Roofing & Sheet Metal	2.21	\$	1,440,000	2.21	\$	1,440,000	2.21	\$	1,440,000	2.21	\$	1,440,000	2.41	\$	1,574,400	2.41	\$	1,574,400	2.41	\$	1,574,400	2.41	\$	1,574,400	2.41	\$	1,574,400	2.41	\$	1,574,400				
08-41	Façade	41.38	\$	27,013,850	40.39	\$	26,367,450	41.38	\$	27,013,850	40.39	\$	26,367,450	42.31	\$	27,617,970	42.31	\$	27,617,970	41.82	\$	27,302,850	41.82	\$	27,302,850	51.78	\$	33,802,090	51.78	\$	33,802,090	51.06	\$	33,333,450	
09-21	Drywall	1.71	\$	1,115,040	1.42	\$	929,200	1.71	\$	1,115,040	1.42	\$	929,200	1.71	\$	1,115,040	1.71	\$	1,115,040	1.42	\$	929,200	1.42	\$	929,200	2.08	\$	1,357,440	2.08	\$	1,357,440	1.73	\$	1,131,200	
SUBTOTAL (Architectural)		45	\$	29,568,890	44	\$	28,736,650	45	\$	29,568,890	44	\$	28,736,650	47	\$	30,656,650	47	\$	30,656,650	46	\$	30,155,690	46	\$	30,155,690	57	\$	37,083,170	57	\$	37,083,170	56	\$	36,388,290	
Back Up Item #		1		2		1		2		3		3		4		4		5		5		6		6		6		6		6		6			
22-01	Plumbing	0.26	\$	171,360	0.26	\$	171,360	0.26	\$	171,360	0.26	\$	171,360	0.16	\$	102,816	-	\$	-	0.16	\$	102,816	-	\$	-	0.16	\$	102,816	-	\$	-	-	\$	-	
23-01	HVAC	19.33	\$	12,616,609	19.33	\$	12,616,609	11.98	\$	7,817,909	11.98	\$	7,817,909	5.00	\$	3,265,044	6.05	\$	3,950,649	5.00	\$	3,265,044	6.05	\$	3,950,649	5.94	\$	3,880,544	6.99	\$	4,566,149	5.94	\$	3,880,544	
26-01	Electrical	2.63	\$	1,713,600	2.63	\$	1,713,600	2.63	\$	1,713,600	2.63	\$	1,713,600	2.63	\$	1,713,600	3.15	\$	2,056,320	2.63	\$	1,713,600	3.15	\$	2,056,320	2.63	\$	1,713,600	3.15	\$	2,056,320	2.63	\$	1,713,600	
26-02	Photovoltaics	-			0.34	\$	225,000	0.69	\$	450,000	1.08	\$	705,000	-			-			-	\$	-	-	\$	-	-		-	-	\$	-	-	\$	-	
SUBTOTAL (MEP)		22	\$	14,501,569	23	\$	14,726,569	16	\$	10,152,869	16	\$	10,407,869	8	\$	5,081,460	9	\$	6,006,969	8	\$	5,081,460	9	\$	6,006,969	9	\$	5,696,960	10	\$	6,622,469	9	\$	5,696,960	
Back Up Item #		50		50		51		51		52		53		52		53		54		55		54		55		54		55		55		55			
SUBTOTAL		68	\$	44,070,459	67	\$	43,463,219	61	\$	39,721,759	60	\$	39,144,519	55	\$	35,738,110	56	\$	36,663,619	54	\$	35,237,150	55	\$	36,162,659	66	\$	42,780,130	67	\$	43,705,639	64	\$	42,085,250	
Indirects Costs		20.00%	13.50	\$	8,814,092	13.32	\$	8,692,644	12.17	\$	7,944,352	11.99	\$	7,828,904	10.95	\$	7,147,622	11.23	\$	7,332,724	10.80	\$	7,047,430	11.08	\$	7,232,532	13.11	\$	8,556,026	13.39	\$	8,741,128	12.89	\$	8,417,050
TOTAL COST - VARIABLE SCOPES		81	\$	52,884,551	80	\$	52,155,863	73	\$	47,666,111	72	\$	46,973,423	66	\$	42,885,732	67	\$	43,996,343	65	\$	42,284,580	66	\$	43,395,191	79	\$	51,336,156	80	\$	52,446,767	77	\$	50,502,300	
TOTAL COST - ALL SCOPE		327	\$	213,630,000	326	\$	212,901,312	319	\$	208,411,560	318	\$	207,718,872	312	\$	203,631,181	314	\$	204,741,792	311	\$	203,030,029	313	\$	204,140,640	325	\$	212,081,605	327	\$	213,192,216	324	\$	211,247,749	
+/- to baseline				\$		(728,688)		\$		(5,218,440)		\$		(5,911,128)		\$		(9,998,819)		\$		(8,888,208)		\$		(10,599,971)		\$		(9,489,360)		\$		(1,548,395)	
% change to baseline - on TOTAL COST		NA		-0.34%		-2.44%		-2.77%		-4.68%		-4.16%		-4.96%		-4.44%		-0.72%		-0.20%		-1.12%		-0.60%											
+/- to lowest cost		\$		10,599,971		\$		9,871,283		\$		5,381,531		\$		4,688,843		\$		601,152		\$		1,711,763		\$		1,110,611		\$		9,051,576			
% change to lowest cost - on TOTAL COST		5.22%		4.86%		2.65%		2.31%		0.30%		0.84%		NA		0.55%		4.46%		5.01%		4.05%		4.59%											



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
01 OFFICE HIGHRISE - Base Case - 40% vision (10% & 20% Stretch)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	652,800 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,440,000	2.21 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - metal panel, backpan, 5" insulation	96,960 sf	4,363,200	45.00 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	27,013,850	41.38 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	48,480 sf	1,115,040	23.00 /sf
09-21 DRYWALL	652,800 SF	1,115,040	1.71 /SF
01 OFFICE HIGHRISE - Base Case - 40% vision (10% & 20% Stretch)	652,800 SF	29,568,890	45.30 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
02 OFFICE HIGHRISE - Base Case - 50% vision (10% & 20% Stretch)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	652,800 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,440,000	2.21 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - metal panel, backpan, 5" insulation	80,800 sf	3,636,000	45.00 /sf
- premium - argon - (1) cavity	80,800 sf	80,800	1.00 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	26,367,450	40.39 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	40,400 sf	929,200	23.00 /sf
09-21 DRYWALL	652,800 SF	929,200	1.42 /SF
02 OFFICE HIGHRISE - Base Case - 50% vision (10% & 20% Stretch)	652,800 SF	28,736,650	44.02 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
03 OFFICE HIGHRISE - Optimized - 40% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	652,800 SF	195,840	0.30 /SF
01-30 GENERAL CONDITIONS	652,800 SF	210,840	0.32 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	652,800 SF	138,400	0.21 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,574,400	2.41 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - argon - (1) cavity	64,640 sf	64,640	1.00 /sf
- premium - metal panel, backpan, 5" insulation	96,960 sf	4,363,200	45.00 /sf
- premium - 4" foil faced insulation at mullions	96,960 sf	533,280	5.50 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	27,617,970	42.31 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	48,480 sf	1,115,040	23.00 /sf
09-21 DRYWALL	652,800 SF	1,115,040	1.71 /SF
03 OFFICE HIGHRISE - Optimized - 40% vision (Gas & Electric)	652,800 SF	30,656,650	46.96 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
04 OFFICE HIGHRISE - Optimized - 50% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	652,800 SF	195,840	0.30 /SF
01-30 GENERAL CONDITIONS	652,800 SF	210,840	0.32 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	652,800 SF	138,400	0.21 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,574,400	2.41 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - (1) additional low-e surface	80,800 sf	484,800	6.00 /sf
- premium - argon - (1) cavity	80,800 sf	80,800	1.00 /sf
- premium - metal panel, backpan, 5" insulation	80,800 sf	3,636,000	45.00 /sf
- premium - 4" foil faced insulation at mullions	80,800 sf	444,400	5.50 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	27,302,850	41.82 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	40,400 sf	929,200	23.00 /sf
09-21 DRYWALL	652,800 SF	929,200	1.42 /SF
04 OFFICE HIGHRISE - Optimized - 50% vision (Gas & Electric)	652,800 SF	30,155,690	46.19 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
05 OFFICE HIGHRISE - Passive House - 40% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	652,800 SF	195,840	0.30 /SF
01-30 GENERAL CONDITIONS	652,800 SF	210,840	0.32 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	652,800 SF	138,400	0.21 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,574,400	2.41 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium - triple glazed	10 lvs	11,000	1,100.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - triple pane - glass assembly	64,640 sf	1,777,600	27.50 /sf
- premium - triple pane - framing/attachment premium	161,600 sf	1,616,000	10.00 /sf
- premium - (2) additional low-e surfaces	64,640 sf	775,680	12.00 /sf
- premium - argon - (2) cavities	64,640 sf	129,280	2.00 /sf
- premium - metal panel, backpan, 5" insulation	96,960 sf	4,363,200	45.00 /sf
- premium - additional 4" insulation in-board	96,960 sf	1,939,200	20.00 /sf
- premium - 4" foil faced insulation at mullions	96,960 sf	533,280	5.50 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	33,802,090	51.78 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	48,480 sf	1,357,440	28.00 /sf
09-21 DRYWALL	652,800 SF	1,357,440	2.08 /SF
05 OFFICE HIGHRISE - Passive House - 40% vision (Gas & Electric)	652,800 SF	37,083,170	56.81 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
06 OFFICE HIGHRISE - Passive House - 50% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	652,800 SF	195,840	0.30 /SF
01-30 GENERAL CONDITIONS	652,800 SF	210,840	0.32 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	652,800 SF	138,400	0.21 /SF
07-50 MEMBRANE ROOFING			
- premium - R-45	38,400 sf	134,400	3.50 /sf
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	652,800 SF	1,574,400	2.41 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	12,800 sf	1,536,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium - triple glazed	10 lvs	11,000	1,100.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	161,600 sf	19,715,200	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - triple pane - glass assembly	80,800 sf	2,222,000	27.50 /sf
- premium - triple pane - framing/attachment premium	161,600 sf	1,616,000	10.00 /sf
- premium - (2) additional low-e surfaces	80,800 sf	969,600	12.00 /sf
- premium - argon - (2) cavities	80,800 sf	161,600	2.00 /sf
- premium - metal panel, backpan, 5" insulation	80,800 sf	3,636,000	45.00 /sf
- premium - additional 4" insulation in-board	80,800 sf	1,616,000	20.00 /sf
- premium - 4" foil faced insulation at mullions	80,800 sf	444,400	5.50 /sf
Firestopping	12,800 lf	320,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	652,800 SF	33,333,450	51.06 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	40,400 sf	1,131,200	28.00 /sf
09-21 DRYWALL	652,800 SF	1,131,200	1.73 /SF
06 OFFICE HIGHRISE - Passive House - 50% vision (Gas & Electric)	652,800 SF	36,388,290	55.74 /SF

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
50 OFFICE HIGHRISE - Base Case - 40% Vision (10% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	652,800 sf	171,360	0.26 /sf
22-01 PLUMBING	652,800 sf	171,360	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	614,400 sf	614,400	1.00 /sf
Perimeter radiation piping distrubtion	652,800 sf	1,305,600	2.00 /sf
Hydronic piping connections @ VAV's	92 ea	126,813	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Variable air volume box w coil (1/1000 sf of fitout, 15% of GSF)	92 ea	121,115	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 3,000 mbh	4 ea	220,568	55,142.00 /ea
Chiller/water cooled/centrifugal - 475 tons	3 ea	834,528	278,176.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 900 ton	2 ea	393,126	196,563.00 /ea
AHU (VAV/hw&cw coil/economizer) (1-unit)	16,000 cfm	176,400	11.03 /cfm
AHU (VAV/hw&cw coil/economizer) (9-unit)	576,000 cfm	6,350,400	11.03 /cfm
Finned-tube radiation w/enclosure	12,000 lf	2,438,910	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	652,800 sf	12,616,609	19.33 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	652,800 sf	1,713,600	2.63 /sf
50 OFFICE HIGHRISE - Base Case - 40% Vision (10% Stretch Code)	652,800 sf	14,501,569	22.21 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
51 OFFICE HIGHRISE - Base Case - 50% Vision (10% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	652,800 sf	171,360	0.26 /sf
22-01 PLUMBING	652,800 sf	171,360	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	614,400 sf	614,400	1.00 /sf
Perimeter radiation piping distrubtion	652,800 sf	1,305,600	2.00 /sf
Hydronic piping connections @ VAV's	92 ea	126,813	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Variable air volume box w coil (1/1000 sf of fitout, 15% of GSF)	92 ea	121,115	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 3,000 mbh	4 ea	220,568	55,142.00 /ea
Chiller/water cooled/centrifugal - 475 tons	3 ea	834,528	278,176.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 900 ton	2 ea	393,126	196,563.00 /ea
AHU (VAV/hw&cw coil/economizer) (1-unit)	16,000 cfm	176,400	11.03 /cfm
AHU (VAV/hw&cw coil/economizer) (9-unit)	576,000 cfm	6,350,400	11.03 /cfm
Finned-tube radiation w/enclosure	12,000 lf	2,438,910	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	652,800 sf	12,616,609	19.33 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	652,800 sf	1,713,600	2.63 /sf
26-02 PHOTOVOLTAIC SYSTEM			
Photovoltaics system (45kW)	45,000 watt	225,000	5.00 /watt
26-02 PHOTOVOLTAIC SYSTEM	652,800 sf	225,000	0.35 /sf
51 OFFICE HIGHRISE - Base Case - 50% Vision (10% Stretch Code)	652,800 sf	14,726,569	22.56 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
52 OFFICE HIGHRISE - Base Case - 40% Vision (20% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	652,800 sf	171,360	0.26 /sf
22-01 PLUMBING	652,800 sf	171,360	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	614,400 sf	614,400	1.00 /sf
Perimeter radiation piping distrubtion	652,800 sf	1,305,600	2.00 /sf
Hydronic piping connections @ VAV's	92 ea	126,813	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Variable air volume box w coil (1/1000 sf of fitout, 15% of GSF)	92 ea	121,115	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 3,000 mbh	4 ea	220,568	55,142.00 /ea
Chiller/water cooled/centrifugal - 450 tons	3 ea	793,278	264,426.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 850 ton	2 ea	372,226	186,113.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	97,650	16.28 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,692,600	16.28 /cfm
Finned-tube radiation w/enclosure	12,000 lf	2,438,910	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	652,800 sf	7,817,909	11.98 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	652,800 sf	1,713,600	2.63 /sf
26-02 PHOTOVOLTAIC SYSTEM			
Photovoltaics system (90kW)	90,000 watt	450,000	5.00 /watt
26-02 PHOTOVOLTAIC SYSTEM	652,800 sf	450,000	0.69 /sf
52 OFFICE HIGHRISE - Base Case - 40% Vision (20% Stretch Code)	652,800 sf	10,152,869	15.55 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
53 OFFICE HIGHRISE - Base Case - 50% Vision (20% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	652,800 sf	171,360	0.26 /sf
22-01 PLUMBING	652,800 sf	171,360	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	614,400 sf	614,400	1.00 /sf
Perimeter radiation piping distrubtion	652,800 sf	1,305,600	2.00 /sf
Hydronic piping connections @ VAV's	92 ea	126,813	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Variable air volume box w coil (1/1000 sf of fitout, 15% of GSF)	92 ea	121,115	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 3,000 mbh	4 ea	220,568	55,142.00 /ea
Chiller/water cooled/centrifugal - 450 tons	3 ea	793,278	264,426.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 850 ton	2 ea	372,226	186,113.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	97,650	16.28 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,692,600	16.28 /cfm
Finned-tube radiation w/enclosure	12,000 lf	2,438,910	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	652,800 sf	7,817,909	11.98 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	652,800 sf	1,713,600	2.63 /sf
26-02 PHOTOVOLTAIC SYSTEM			
Photovoltaics system (141kW)	141,000 watt	705,000	5.00 /watt
26-02 PHOTOVOLTAIC SYSTEM	652,800 sf	705,000	1.08 /sf
53 OFFICE HIGHRISE - Base Case - 50% Vision (20% Stretch Code)	652,800 sf	10,407,869	15.94 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
54 OFFICE HIGHRISE - Optimized - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	652,800 sf	102,816	0.16 /sf
22-01 PLUMBING	652,800 sf	102,816	0.16 /sf
23-01 HVAC			
Hydronic piping connections @ FCU's	62 ea	147,566	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/gas/high eff. cond. - 1,350 mbh	4 ea	111,668	27,917.00 /ea
Chiller/water cooled/centrifugal - 420 tons	3 ea	743,778	247,926.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 800 ton	2 ea	351,326	175,663.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	91,350	15.23 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,583,400	15.23 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	62 ea	210,824	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	652,800 sf	3,265,044	5.00 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	652,800 sf	1,713,600	2.63 /sf
54 OFFICE HIGHRISE - Optimized - Gas-Heat	652,800 sf	5,081,460	7.78 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
55 OFFICE HIGHRISE - Optimized - Electric-Heat			
23-01 HVAC			
Fuel oil system for boiler	1 ls	150,000	150,000.00 /ls
Hydronic piping connections @ FCU's	62 ea	147,566	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/oil/high eff. cond. - 2,000 mbh	1 ea	47,442	47,442.00 /ea
Chiller/water cooled/centrifugal - 420 tons	2 ea	495,852	247,926.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 525 ton	2 ea	236,376	118,188.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	91,350	15.23 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,583,400	15.23 /cfm
Heat pump heater/chiller/air cooled - 40 ton	11 ea	962,707	87,518.80 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	62 ea	210,824	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	652,800 sf	3,950,649	6.05 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	2,056,320	3.15 /sf
26-01 ELECTRICAL	652,800 sf	2,056,320	3.15 /sf
55 OFFICE HIGHRISE - Optimized - Electric-Heat	652,800 sf	6,006,969	9.20 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
56 OFFICE HIGHRISE - Passive House - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	652,800 sf	102,816	0.16 /sf
22-01 PLUMBING	460,800 sf	102,816	0.22 /sf
23-01 HVAC			
Aeroseal - ductwork (based on 1.2cfm/sf & 10% duct leakage)	62,500 cfm	500,000	8.00 /cfm
Hydronic piping connections @ FCU's	62 ea	147,566	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/gas/high eff. cond. - 1,350 mbh	4 ea	111,668	27,917.00 /ea
Chiller/water cooled/centrifugal - 420 tons	3 ea	743,778	247,926.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 800 ton	2 ea	351,326	175,663.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	97,650	16.28 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,692,600	16.28 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	62 ea	210,824	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	460,800 sf	3,880,544	8.42 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	1,713,600	2.63 /sf
26-01 ELECTRICAL	460,800 sf	1,713,600	3.72 /sf
56 OFFICE HIGHRISE - Passive House - Gas-Heat	460,800 sf	5,696,960	12.36 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
57 OFFICE HIGHRISE - Passive House - Electric-Heat			
23-01 HVAC			
Aeroseal - ductwork (based on 1.2cfm/sf & 10% duct leakage)	62,500 cfm	500,000	8.00 /cfm
Fuel oil system for boiler	1 ls	150,000	150,000.00 /ls
Hydronic piping connections @ FCU's	62 ea	147,566	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/oil/high eff. cond. - 2,000 mbh	1 ea	47,442	47,442.00 /ea
Chiller/water cooled/centrifugal - 420 tons	2 ea	495,852	247,926.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 525 ton	2 ea	236,376	118,188.00 /ea
DOAS (VAV/hw&cw coil/economizer/ER wheel) (1-unit)	6,000 cfm	97,650	16.28 /cfm
DOAS (VAV/hw&cw coil/economizer/ER wheel) (4-unit)	104,000 cfm	1,692,600	16.28 /cfm
Heat pump heater/chiller/air cooled - 40 ton	11 ea	962,707	87,518.80 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	62 ea	210,824	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	460,800 sf	4,566,149	9.91 /sf
26-01 ELECTRICAL			
Mechanical power & connection	652,800 sf	2,056,320	3.15 /sf
26-01 ELECTRICAL	460,800 sf	2,056,320	4.46 /sf
57 OFFICE HIGHRISE - Passive House - Electric-Heat	460,800 sf	6,622,469	14.37 /sf



CONSIGLI
Est. 1905

OFFICE/LAB

MA DOER - Stretch Code Study
Office/Lab - Core & Shell Only - BASELINE COST

June 11, 2021



		PARKING		TOWER		BASELINE				
WBS	DESCRIPTION	Total Cost 76,800 SF		Total Cost 384,000 SF		Total Cost 460,800 SF				
01-10	Testing	\$	-	-	\$	-	-			
01-50	Temporary Hoist	-	\$	4.00	\$	1,536,000	3.33			
01-55	Winter Conditions	1.50	\$	115,000	1.50	\$	576,000	1.50		
01-60	Final Cleaning	0.25	\$	19,000	0.25	\$	96,000	0.25		
03-30	Concrete	75.00	\$	5,760,000	20.00	\$	7,680,000	29.17		
04-20	Masonry	4.00	\$	307,000	2.00	\$	768,000	2.33		
05-12	Structural Steel - base scope	6.00	\$	461,000	46.00	\$	17,664,000	39.33		
	Structural Steel - variable scope	-	\$	-	-	\$	-	-		
05-50	Miscellaneous Metals	5.50	\$	422,000	5.50	\$	2,112,000	5.50		
06-25	Architectural Millwork/Casework	-	\$	-	1.00	\$	384,000	0.83		
07-10	Waterproofing/Caulking	11.00	\$	845,000	2.00	\$	768,000	3.50		
07-50	Roofing & Sheet Metal - base scope	\$	-	1.70	\$	653,000	1.42	\$	653,000	
	Roofing & Sheet Metal - variable scope	\$	-	3.75	\$	1,440,000	3.13	\$	1,440,000	
07-81	Fireproofing	2.25	\$	173,000	2.25	\$	864,000	2.25		
08-10	Doors, Frames, Hardware	0.75	\$	58,000	1.00	\$	384,000	0.96		
08-36	Overhead Doors	0.40	\$	31,000	0.10	\$	38,000	0.15		
08-41	Façade	\$	-	51.79	\$	19,887,000	43.16	\$	19,887,000	
08-80	Interior Aluminum, Glass & Glazing	0.50	\$	38,000	0.75	\$	288,000	0.71		
09-21	Drywall - base scope	\$	-	15.00	\$	5,760,000	12.50	\$	5,760,000	
	Drywall - variable scope	\$	-	2.01	\$	773,000	1.68	\$	773,000	
09-30	Tile	0.20	\$	15,000	1.00	\$	384,000	0.87		
09-51	Acoustical Ceilings	2.75	\$	211,000	0.20	\$	77,000	0.63		
09-54	Specialty Ceilings	\$	-	1.25	\$	480,000	1.04	\$	480,000	
09-60	Floors	0.10	\$	8,000	1.00	\$	384,000	0.85		
09-90	Painting	1.50	\$	115,000	1.50	\$	576,000	1.50		
10-01	Typical Specialties	\$	-	0.75	\$	288,000	0.63	\$	288,000	
10-14	Signage	0.10	\$	8,000	0.10	\$	38,000	0.10		
10-95	Misc. Specialties	\$	-	0.50	\$	192,000	0.42	\$	192,000	
11-12	Parking Equipment	1.25	\$	96,000	-	\$	-	0.21	\$	96,000
11-24	Window Washing Equipment	\$	-	0.50	\$	192,000	0.42	\$	192,000	
11-40	Food Service Equipment	\$	-	-	\$	-	-	\$	-	
11-95	Other Equipment	\$	-	0.50	\$	192,000	0.42	\$	192,000	
14-20	Elevators	9.00	\$	691,000	11.00	\$	4,224,000	10.67	\$	4,915,000
21-01	Fire Protection	7.50	\$	576,000	6.00	\$	2,304,000	6.25	\$	2,880,000
22-01	Plumbing - base scope	7.00	\$	538,000	15.00	\$	5,760,000	13.67	\$	6,298,000
	Plumbing - variable scope	\$	-	0.32	\$	121,000	0.26	\$	121,000	
23-01	HVAC - base scope	10.00	\$	768,000	39.01	\$	14,981,000	34.18	\$	15,749,000
	HVAC - variable scope	\$	-	38.99	\$	14,971,000	32.49	\$	14,971,000	
26-01	Electrical - base scope	18.00	\$	1,382,000	32.00	\$	12,288,000	29.67	\$	13,670,000
	Electrical - variable scope	-	\$	-	3.78	\$	1,452,000	3.15	\$	1,452,000
31-23	Site Work	40.00	\$	3,072,000	5.00	\$	1,920,000	10.83	\$	4,992,000
31-24	Piles	\$	-	4.00	\$	1,536,000	3.33	\$	1,536,000	
31-41	Support of Excacation (SOE)	60.00	\$	4,608,000	\$	-	10.00	\$	4,608,000	
32-10	Landscaping & Site Improvements	\$	-	4.00	\$	1,536,000	3.33	\$	1,536,000	
32-31	Fencing	-	\$	-	-	\$	-	-	\$	-
33-10	Utilities	1.50	\$	115,000	1.50	\$	576,000	1.50	\$	691,000
SUBTOTAL		266	\$	20,432,000	328	\$	126,143,000	318	\$	146,575,000
Indirects Costs20.00%		53.21	\$	4,086,400	65.70	\$	25,228,600	63.62	\$	29,315,000
TOTAL COST		319	\$	24,518,400	394	\$	151,371,600	382	\$	175,890,000



WBS		DESCRIPTION		BASE CASE - 10% Stretch				BASE CASE - 20% Stretch				OPTIMIZED								PASSIVE HOUSE															
				40% Vision		50% Vision		40% Vision		50% Vision		40% Vision				50% Vision				40% Vision				50% Vision											
				Gas Heat				Gas Heat				Gas Heat				Electric Heat				Gas Heat				Electric Heat				Gas Heat				Electric Heat			
				Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF		Total Cost 460,800 SF									
01-10	Testing	-	\$ -	-	\$ -	-	\$ -	-	\$ -	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240	0.33	\$ 153,240										
05-12	Structural Steel	-	\$ -	-	\$ -	-	\$ -	-	\$ -	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400	0.30	\$ 138,400										
07-50	Roofing & Sheet Metal	3.13	\$ 1,440,000	3.13	\$ 1,440,000	3.13	\$ 1,440,000	3.13	\$ 1,440,000	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400	3.42	\$ 1,574,400										
08-41	Façade	43.16	\$ 19,887,450	42.19	\$ 19,439,450	43.16	\$ 19,887,450	42.19	\$ 19,439,450	44.07	\$ 20,308,050	44.07	\$ 20,308,050	43.60	\$ 20,089,650	43.60	\$ 20,089,650	53.38	\$ 24,597,450	53.38	\$ 24,597,450	52.68	\$ 24,272,650	52.68	\$ 24,272,650										
09-21	Drywall	1.68	\$ 772,800	1.40	\$ 644,000	1.68	\$ 772,800	1.40	\$ 644,000	1.68	\$ 772,800	1.68	\$ 772,800	1.40	\$ 644,000	1.40	\$ 644,000	2.04	\$ 940,800	2.04	\$ 940,800	1.70	\$ 784,000	1.70	\$ 784,000										
SUBTOTAL (Architectural)		48	\$ 22,100,250	47	\$ 21,523,450	48	\$ 22,100,250	47	\$ 21,523,450	50	\$ 22,946,890	50	\$ 22,946,890	49	\$ 22,599,690	49	\$ 22,599,690	59	\$ 27,404,290	59	\$ 27,404,290	58	\$ 26,922,690	58	\$ 26,922,690										
Back Up Item #		7		8		7		8		9		9		10		10		11		11		12		12											
22-01	Plumbing	0.26	\$ 120,960	0.26	\$ 120,960	0.26	\$ 120,960	0.26	\$ 120,960	0.16	\$ 72,576	-	\$ -	0.16	\$ 72,576	-	\$ -	0.16	\$ 72,576	-	\$ -	0.16	\$ 72,576	-	\$ -										
23-01	HVAC	32.49	\$ 14,971,422	32.49	\$ 14,971,422	29.15	\$ 13,430,051	29.15	\$ 13,430,051	26.60	\$ 12,259,390	27.94	\$ 12,873,497	26.60	\$ 12,259,390	27.94	\$ 12,873,497	27.38	\$ 12,615,390	28.71	\$ 13,229,497	27.38	\$ 12,615,390	28.71	\$ 13,229,497										
26-01	Electrical	3.15	\$ 1,451,520	3.15	\$ 1,451,520	3.15	\$ 1,451,520	3.15	\$ 1,451,520	3.15	\$ 1,451,520	3.68	\$ 1,693,440	3.15	\$ 1,451,520	3.68	\$ 1,693,440	3.15	\$ 1,451,520	3.68	\$ 1,693,440	3.15	\$ 1,451,520	3.68	\$ 1,693,440										
SUBTOTAL (MEP)		36	\$ 16,543,902	36	\$ 16,543,902	33	\$ 15,002,531	33	\$ 15,002,531	30	\$ 13,783,486	32	\$ 14,566,937	30	\$ 13,783,486	32	\$ 14,566,937	31	\$ 14,139,486	32	\$ 14,922,937	31	\$ 14,139,486	32	\$ 14,922,937										
Back Up Item #		56		56		57		57		58		59		58		59		60		61		60		61											
SUBTOTAL		84	\$ 38,644,152	83	\$ 38,067,352	81	\$ 37,102,781	79	\$ 36,525,981	80	\$ 36,730,376	81	\$ 37,513,827	79	\$ 36,383,176	81	\$ 37,166,627	90	\$ 41,543,776	92	\$ 42,327,227	89	\$ 41,062,176	91	\$ 41,845,627										
Indirects Costs 20.00%		16.77	\$ 7,728,830	16.52	\$ 7,613,470	16.10	\$ 7,420,556	15.85	\$ 7,305,196	15.94	\$ 7,346,075	16.28	\$ 7,502,765	15.79	\$ 7,276,635	16.13	\$ 7,433,325	18.03	\$ 8,308,755	18.37	\$ 8,465,445	17.82	\$ 8,212,435	18.16	\$ 8,369,125										
TOTAL COST - VARIABLE SCOPES		101	\$ 46,372,982	99	\$ 45,680,822	97	\$ 44,523,337	95	\$ 43,831,177	96	\$ 44,076,451	98	\$ 45,016,592	95	\$ 43,659,811	97	\$ 44,599,952	108	\$ 49,852,531	110	\$ 50,792,672	107	\$ 49,274,611	109	\$ 50,214,752										
TOTAL COST - ALL SCOPE		382	\$ 175,890,000	380	\$ 175,197,840	378	\$ 174,040,355	376	\$ 173,348,195	377	\$ 173,593,469	379	\$ 174,533,610	376	\$ 173,176,829	378	\$ 174,116,970	389	\$ 179,369,549	391	\$ 180,309,690	388	\$ 178,791,629	390	\$ 179,731,770										
+/- to baseline		\$ (692,160)		\$ (1,849,645)		\$ (2,541,805)		\$ (2,296,531)		\$ (1,356,390)		\$ (2,713,171)		\$ (1,773,030)		\$ 3,479,549		\$ 4,419,690		\$ 2,901,629		\$ 3,841,770													
% change to baseline - on TOTAL COST		NA		-0.39%		-1.05%		-1.45%		-1.31%		-0.77%		-1.54%		-1.01%		1.98%		2.51%		1.65%		2.18%											
+/- to lowest cost		\$ 2,713,171		\$ 2,021,011		\$ 863,526		\$ 171,366		\$ 416,640		\$ 1,356,781		\$ -		\$ 940,141		\$ 6,192,720		\$ 7,132,861		\$ 5,614,800		\$ 6,554,941											
% change to lowest cost - on TOTAL COST		1.57%		1.17%		0.50%		0.10%		0.24%		0.78%		NA		0.54%		3.57%		4.11%		3.24%		3.78%											



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
07 OFFICE/Lab - Base Case - 40% vision (10% & 20% Stretch)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	460,800 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,440,000	3.13 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - metal panel, backpan, 5" insulation	67,200 sf	3,024,000	45.00 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	19,887,450	43.16 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	33,600 sf	772,800	23.00 /sf
09-21 DRYWALL	460,800 SF	772,800	1.68 /SF
07 OFFICE/Lab - Base Case - 40% vision (10% & 20% Stretch)	460,800 SF	22,100,250	47.96 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
08 OFFICE/Lab - Base Case - 50% vision (10% & 20% Stretch)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	460,800 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,440,000	3.13 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - metal panel, backpan, 5" insulation	56,000 sf	2,520,000	45.00 /sf
- premium - argon - (1) cavity	56,000 sf	56,000	1.00 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	19,439,450	42.19 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	28,000 sf	644,000	23.00 /sf
09-21 DRYWALL	460,800 SF	644,000	1.40 /SF
08 OFFICE/Lab - Base Case - 50% vision (10% & 20% Stretch)	460,800 SF	21,523,450	46.71 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
09 OFFICE/Lab - Optimized - 40% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	460,800 SF	138,240	0.30 /SF
01-30 GENERAL CONDITIONS	460,800 SF	153,240	0.33 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	460,800 SF	138,400	0.30 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,574,400	3.42 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - argon - (1) cavity	44,800 sf	44,800	1.00 /sf
- premium - metal panel, backpan, 5" insulation	67,200 sf	3,024,000	45.00 /sf
- premium - 4" foil faced insulation at mullions	67,200 sf	369,600	5.50 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	20,308,050	44.07 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	33,600 sf	772,800	23.00 /sf
09-21 DRYWALL	460,800 SF	772,800	1.68 /SF
09 OFFICE/Lab - Optimized - 40% vision (Gas & Electric)	460,800 SF	22,946,890	49.80 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
10 OFFICE/Lab - Optimized - 50% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	460,800 SF	138,240	0.30 /SF
01-30 GENERAL CONDITIONS	460,800 SF	153,240	0.33 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	460,800 SF	138,400	0.30 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,574,400	3.42 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - (1) additional low-e surface	56,000 sf	336,000	6.00 /sf
- premium - argon - (1) cavity	56,000 sf	56,000	1.00 /sf
- premium - metal panel, backpan, 5" insulation	56,000 sf	2,520,000	45.00 /sf
- premium - 4" foil faced insulation at mullions	56,000 sf	308,000	5.50 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	20,089,650	43.60 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	28,000 sf	644,000	23.00 /sf
09-21 DRYWALL	460,800 SF	644,000	1.40 /SF
10 OFFICE/Lab - Optimized - 50% vision (Gas & Electric)	460,800 SF	22,599,690	49.04 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
11 OFFICE/Lab - Passive House - 40% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	460,800 SF	138,240	0.30 /SF
01-30 GENERAL CONDITIONS	460,800 SF	153,240	0.33 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	460,800 SF	138,400	0.30 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
- premium - R-45	38,400 sf	134,400	3.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,574,400	3.42 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium - triple glazed	10 lvs	11,000	1,100.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - triple pane - glass assembly	44,800 sf	1,232,000	27.50 /sf
- premium - triple pane - framing/attachment premium	112,000 sf	1,120,000	10.00 /sf
- premium - (2) additional low-e surfaces	44,800 sf	537,600	12.00 /sf
- premium - argon - (2) cavities	44,800 sf	89,600	2.00 /sf
- premium - metal panel, backpan, 5" insulation	67,200 sf	3,024,000	45.00 /sf
- premium - additional 4" insulation in-board	67,200 sf	1,344,000	20.00 /sf
- premium - 4" foil faced insulation at mullions	67,200 sf	369,600	5.50 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	24,597,450	53.38 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	33,600 sf	940,800	28.00 /sf
09-21 DRYWALL	460,800 SF	940,800	2.04 /SF
11 OFFICE/Lab - Passive House - 40% vision (Gas & Electric)	460,800 SF	27,404,290	59.47 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
12 OFFICE/Lab - Passive House - 50% vision (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	460,800 SF	138,240	0.30 /SF
01-30 GENERAL CONDITIONS	460,800 SF	153,240	0.33 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	800 lf	100,000	125.00 /lf
Thermal isolation pads at dunnage	38,400 sf	38,400	1.00 /sf
05-12 STRUCTURAL STEEL	460,800 SF	138,400	0.30 /SF
07-50 MEMBRANE ROOFING			
- premium - R-45	38,400 sf	134,400	3.50 /sf
Built-up roof - R-40, including all copings, flashings, etc	38,400 sf	1,440,000	37.50 /sf
07-50 MEMBRANE ROOFING	460,800 SF	1,574,400	3.42 /SF
08-41 FACADE			
Penthouse wall panels, metal panels/louvers	16,000 sf	1,920,000	120.00 /sf
HM doors - exterior - flush (3' x 7')	3 EA	6,450	2,150.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,200	400.00 /EA
Glass entry doors in CW	10 lvs	73,000	7,300.00 /lvs
-premium - triple glazed	10 lvs	11,000	1,100.00 /lvs
-premium for improved gasketing & hardware for air leakage	10 lvs	5,000	500.00 /lvs
Aluminum curtain walls	112,000 sf	13,664,000	122.00 /sf
- 1" insulated IGU, low-e coating one surface	incl		/incl
- premium - triple pane - glass assembly	56,000 sf	1,540,000	27.50 /sf
- premium - triple pane - framing/attachment premium	112,000 sf	1,120,000	10.00 /sf
- premium - (2) additional low-e surfaces	56,000 sf	672,000	12.00 /sf
- premium - argon - (2) cavities	56,000 sf	112,000	2.00 /sf
- premium - metal panel, backpan, 5" insulation	56,000 sf	2,520,000	45.00 /sf
- premium - additional 4" insulation in-board	56,000 sf	1,120,000	20.00 /sf
- premium - 4" foil faced insulation at mullions	56,000 sf	308,000	5.50 /sf
Firestopping	8,000 lf	200,000	25.00 /lf
Mock-up - visual	1 ls	150,000	150,000.00 /ls
Mock-up - performance	1 ls	350,000	350,000.00 /ls
Design assist	1 ls	250,000	250,000.00 /ls
Come-backs - hoist, crane leave outs	1 ls	250,000	250,000.00 /ls
08-41 FACADE	460,800 SF	24,272,650	52.68 /SF
09-21 DRYWALL			
GWB partition - exterior - framing & board - sill	28,000 sf	784,000	28.00 /sf
09-21 DRYWALL	460,800 SF	784,000	1.70 /SF
12 OFFICE/Lab - Passive House - 50% vision (Gas & Electric)	460,800 SF	26,922,690	58.43 /SF



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
58 OFFICE/LAB - Base Case - 40% & 50% Vision (10% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	460,800 sf	120,960	0.26 /sf
22-01 PLUMBING	460,800 sf	120,960	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	422,400 sf	422,400	1.00 /sf
Perimeter radiation piping distrubtion	460,800 sf	921,600	2.00 /sf
Hydronic piping connections @ VAV's	63 ea	86,839	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Variable air volume box w coil (1/1000 sf of fitout, 15% of GSF)	63 ea	82,937	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 5,400 mbh	7 ea	663,194	94,742.00 /ea
Glycol loop energy recovery system	460,800 sf	1,152,000	2.50 /sf
Chiller/water cooled/centrifugal - 825 tons	4 ea	1,882,704	470,676.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 4,200 ton	1 ls	911,652	911,652.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (8-units)	560,000 cfm	7,350,000	13.13 /cfm
Finned-tube radiation w/enclosure	7,200 lf	1,463,346	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	460,800 sf	14,971,422	32.49 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,451,520	3.15 /sf
26-01 ELECTRICAL	460,800 sf	1,451,520	3.15 /sf
58 OFFICE/LAB - Base Case - 40% & 50% Vision (10% Stretch Code)	460,800 sf	16,543,902	35.90 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
59 OFFICE/LAB - Base Case - 40% & 50% Vision (20% Stretch Code)			
22-01 PLUMBING			
Natural gas distribution (4-boilers)	460,800 sf	120,960	0.26 /sf
22-01 PLUMBING	460,800 sf	120,960	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	422,400 sf	422,400	1.00 /sf
Perimeter radiation piping distrubtion	460,800 sf	921,600	2.00 /sf
Hydronic piping connections @ VAV's	63 ea	86,839	1,378.40 /ea
HW pump/base mount/40 hp	2 ea	19,629	9,814.40 /ea
Boiler/HW/gas/high eff. cond. - 5,400 mbh	7 ea	663,194	94,742.00 /ea
Glycol loop energy recovery system	460,800 sf	1,152,000	2.50 /sf
Chiller/water cooled/centrifugal - 825 tons	4 ea	1,882,704	470,676.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 4,200 ton	1 ls	911,652	911,652.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (6-units)	438,000 cfm	5,748,750	13.13 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	42 ea	142,816	3,400.38 /ea
Finned-tube radiation w/enclosure	7,200 lf	1,463,346	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 40 hp (HW pumps)	2 ea	15,121	7,560.37 /ea
23-01 HVAC	460,800 sf	13,430,051	29.15 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,451,520	3.15 /sf
26-01 ELECTRICAL	460,800 sf	1,451,520	3.15 /sf
59 OFFICE/LAB - Base Case - 40% & 50% Vision (20% Stretch Code)	460,800 sf	15,002,531	32.56 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
60 OFFICE/LAB - Optimized - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	460,800 sf	72,576	0.16 /sf
22-01 PLUMBING	460,800 sf	72,576	0.16 /sf
23-01 HVAC			
Hydronic piping connections @ FCU's	42 ea	99,964	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/gas/high eff. cond. - 5,400 mbh	5 ea	473,710	94,742.00 /ea
Intelegant glycol loop energy recovery system	460,800 sf	2,304,000	5.00 /sf
Chiller/water cooled/centrifugal - 825 tons	3 ea	1,412,028	470,676.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 3,100 ton	1 ls	673,289	673,289.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (6-units)	438,000 cfm	7,128,450	16.28 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	42 ea	142,816	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	460,800 sf	12,259,390	26.61 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,451,520	3.15 /sf
26-01 ELECTRICAL	460,800 sf	1,451,520	3.15 /sf
60 OFFICE/LAB - Optimized - Gas-Heat	460,800 sf	13,783,486	29.91 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
61 OFFICE/LAB - Optimized - Electric-Heat			
23-01 HVAC			
Fuel oil system for boiler	1 ls	150,000	150,000.00 /ls
Hydronic piping connections @ FCU's	42 ea	99,964	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/oil/high eff. cond. - 2,000 mbh	1 ea	47,442	47,442.00 /ea
Intelegant glycol loop energy recovery system	460,800 sf	2,304,000	5.00 /sf
Chiller/water cooled/centrifugal - 1,050 tons	2 ea	1,188,852	594,426.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 4,200 ton	1 ls	911,652	911,652.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (6-units)	438,000 cfm	7,128,450	16.28 /cfm
Heat pump heater/chiller/air cooled - 40 ton	10 ea	875,188	87,518.80 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	42 ea	142,816	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	460,800 sf	12,873,497	27.94 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,693,440	3.68 /sf
26-01 ELECTRICAL	460,800 sf	1,693,440	3.68 /sf
61 OFFICE/LAB - Optimized - Electric-Heat	460,800 sf	14,566,937	31.61 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
62 OFFICE/LAB - Passive House - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	460,800 sf	72,576	0.16 /sf
22-01 PLUMBING	25,200 sf	72,576	2.88 /sf
23-01 HVAC			
Aeroseal - ductwork (based on 1.2cfm/sf & 10% duct leakage)	44,500 cfm	356,000	8.00 /cfm
Hydronic piping connections @ FCU's	42 ea	99,964	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/gas/high eff. cond. - 5,400 mbh	5 ea	473,710	94,742.00 /ea
Intelegant glycol loop energy recovery system	460,800 sf	2,304,000	5.00 /sf
Chiller/water cooled/centrifugal - 825 tons	3 ea	1,412,028	470,676.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 3,100 ton	1 ls	673,289	673,289.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (6-units)	438,000 cfm	7,128,450	16.28 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	42 ea	142,816	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	25,200 sf	12,615,390	500.61 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,451,520	3.15 /sf
26-01 ELECTRICAL	25,200 sf	1,451,520	57.60 /sf
62 OFFICE/LAB - Passive House - Gas-Heat	25,200 sf	14,139,486	561.09 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
63 OFFICE/LAB - Passive House - Electric-Heat			
23-01 HVAC			
Aeroseal - ductwork (based on 1.2cfm/sf & 10% duct leakage)	44,500 cfm	356,000	8.00 /cfm
Fuel oil system for boiler	1 ls	150,000	150,000.00 /ls
Hydronic piping connections @ FCU's	42 ea	99,964	2,380.10 /ea
HW pump/base mount/24 hp	2 ea	13,972	6,985.80 /ea
Boiler/HW/oil/high eff. cond. - 2,000 mbh	1 ea	47,442	47,442.00 /ea
Intelegant glycol loop energy recovery system	460,800 sf	2,304,000	5.00 /sf
Chiller/water cooled/centrifugal - 1,050 tons	2 ea	1,188,852	594,426.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 4,200 ton	1 ls	911,652	911,652.00 /ls
AHU (VAV/hw/cw/recovery coil/economizer) (6-units)	438,000 cfm	7,128,450	16.28 /cfm
Heat pump heater/chiller/air cooled - 40 ton	10 ea	875,188	87,518.80 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (1/1500 sf of fitout, 15% of GSF)	42 ea	142,816	3,400.38 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 25 hp (HW pumps)	2 ea	11,161	5,580.37 /ea
23-01 HVAC	25,200 sf	13,229,497	524.98 /sf
26-01 ELECTRICAL			
Mechanical power & connection	460,800 sf	1,693,440	3.68 /sf
26-01 ELECTRICAL	25,200 sf	1,693,440	67.20 /sf
63 OFFICE/LAB - Passive House - Electric-Heat	25,200 sf	14,922,937	592.18 /sf



CONSIGLI
Est. 1905

SMALL OFFICE

MA DOER - Stretch Code Study

Small Office - BASELINE COST

June 11, 2021



WBS	DESCRIPTION	CORE-SHELL		TI		BASELINE	
		Total Cost 25,200 SF		Total Cost 20,160 SF		Total Cost 25,200 SF	
01-10	Testing	-	\$ -	-	\$ -	-	\$ -
01-50	Temporary Hoist		\$ -		\$ -	-	\$ -
01-55	Winter Conditions	3.00	\$ 76,000		\$ -	3.02	\$ 76,000
01-60	Final Cleaning		\$ -	1.00	\$ 20,000	0.79	\$ 20,000
03-30	Concrete	32.00	\$ 806,000		\$ -	31.98	\$ 806,000
04-20	Masonry	6.00	\$ 151,000		\$ -	5.99	\$ 151,000
05-12	Structural Steel - base scope	36.00	\$ 907,000		\$ -	35.99	\$ 907,000
	Structural Steel - variable scope	-	\$ -	-	\$ -	-	\$ -
05-50	Miscellaneous Metals	7.00	\$ 176,000	2.00	\$ 40,000	8.57	\$ 216,000
06-25	Architectural Millwork/Casework		\$ -	12.00	\$ 242,000	9.60	\$ 242,000
07-10	Waterproofing/Caulking	4.00	\$ 101,000	1.00	\$ 20,000	4.80	\$ 121,000
07-50	Roofing & Sheet Metal - base scope	2.00	\$ 50,000		\$ -	1.98	\$ 50,000
	Roofing & Sheet Metal - variable scope	14.25	\$ 359,000	-	\$ -	14.25	\$ 359,000
07-81	Fireproofing		\$ -		\$ -	-	\$ -
08-10	Doors, Frames, Hardware	2.00	\$ 50,000	3.50	\$ 71,000	4.80	\$ 121,000
08-36	Overhead Doors		\$ -		\$ -	-	\$ -
08-41	Façade	42.62	\$ 1,074,000	-	\$ -	42.62	\$ 1,074,000
08-80	Interior Aluminum, Glass & Glazing		\$ -	6.00	\$ 121,000	4.80	\$ 121,000
09-21	Drywall - base scope	17.00	\$ 428,000	17.00	\$ 343,000	30.60	\$ 771,000
	Drywall - variable scope	-	\$ -	-	\$ -	-	\$ -
09-30	Tile	1.00	\$ 25,000	1.00	\$ 20,000	1.79	\$ 45,000
09-51	Acoustical Ceilings		\$ -	6.00	\$ 121,000	4.80	\$ 121,000
09-54	Specialty Ceilings		\$ -	2.00	\$ 40,000	1.59	\$ 40,000
09-60	Floors		\$ -	10.00	\$ 202,000	8.02	\$ 202,000
09-90	Painting		\$ -	4.50	\$ 91,000	3.61	\$ 91,000
10-01	Typical Specialties		\$ -	2.00	\$ 40,000	1.59	\$ 40,000
10-14	Signage	0.10	\$ 3,000	0.10	\$ 2,000	0.20	\$ 5,000
10-95	Misc. Specialties	1.00	\$ 25,000	1.00	\$ 20,000	1.79	\$ 45,000
11-12	Parking Equipment		\$ -		\$ -	-	\$ -
11-24	Window Washing Equipment		\$ -		\$ -	-	\$ -
11-40	Food Service Equipment		\$ -		\$ -	-	\$ -
11-95	Other Equipment		\$ -	1.00	\$ 20,000	0.79	\$ 20,000
14-20	Elevators	4.96	\$ 125,000		\$ -	4.96	\$ 125,000
21-01	Fire Protection	5.50	\$ 139,000		\$ -	5.52	\$ 139,000
22-01	Plumbing - base scope	7.00	\$ 176,000	7.00	\$ 141,000	12.58	\$ 317,000
	Plumbing - variable scope	0.26	\$ 7,000	-	\$ -	0.28	\$ 7,000
23-01	HVAC - base scope	25.00	\$ 630,000	34.00	\$ 685,000	52.18	\$ 1,315,000
	HVAC - variable scope	11.47	\$ 289,000	-	\$ -	11.47	\$ 289,000
26-01	Electrical - base scope	22.00	\$ 554,000	22.00	\$ 444,000	39.60	\$ 998,000
	Electrical - variable scope	2.63	\$ 66,000	-	\$ -	2.62	\$ 66,000
31-23	Site Work	20.00	\$ 504,000		\$ -	20.00	\$ 504,000
31-24	Piles		\$ -		\$ -	-	\$ -
31-41	Support of Excavation (SOE)	10.00	\$ 252,000		\$ -	10.00	\$ 252,000
32-10	Landscaping & Site Improvements		\$ -		\$ -	-	\$ -
32-31	Fencing		\$ -		\$ -	-	\$ -
33-10	Utilities	4.00	\$ 101,000		\$ -	4.01	\$ 101,000
SUBTOTAL		277	\$ 7,074,000	133	\$ 2,683,000	387	\$ 9,757,000
Indirects Costs 25.00%		70.18	\$ 1,768,500	33.27	\$ 670,750	96.80	\$ 2,439,250
TOTAL COST		351	\$ 8,842,500	166	\$ 3,353,750	484	\$ 12,196,250



WBS	DESCRIPTION	BASE CASE - IECC2018		BASE CASE - IECC2021		OPTIMIZED		PASSIVE HOUSE	
		Gas Heat		Gas Heat		Gas Heat		Electric Heat	
		Total Cost 25,200 SF		Total Cost 25,200 SF		Total Cost 25,200 SF		Total Cost 25,200 SF	
01-10	Testing	-	\$ -	-	\$ -	1.60	\$ 40,200	1.60	\$ 40,200
05-12	Structural Steel	-	\$ -	-	\$ -	1.00	\$ 25,200	1.00	\$ 25,200
07-50	Roofing & Sheet Metal	14.25	\$ 359,100	14.25	\$ 359,100	16.00	\$ 403,200	16.00	\$ 403,200
08-41	Façade	42.62	\$ 1,074,058	43.95	\$ 1,107,546	49.35	\$ 1,243,596	58.94	\$ 1,485,188
09-21	Drywall	-	\$ -	-	\$ -	-	\$ -	-	\$ -
SUBTOTAL (Architectural)		57	\$ 1,433,158	58	\$ 1,466,646	68	\$ 1,712,196	68	\$ 1,712,196
Back Up Item #		13		14		15		15	
22-01	Plumbing	0.26	\$ 6,615	0.26	\$ 6,615	0.16	\$ 3,969	-	\$ -
23-01	HVAC	11.47	\$ 289,059	11.47	\$ 289,059	14.07	\$ 354,684	18.34	\$ 462,285
26-01	Electrical	2.63	\$ 66,150	2.63	\$ 66,150	2.63	\$ 66,150	3.15	\$ 79,380
SUBTOTAL (MEP)		14	\$ 361,824	14	\$ 361,824	17	\$ 424,803	21	\$ 541,665
Back Up Item #		62		63		64		65	
SUBTOTAL		71	\$ 1,794,982	73	\$ 1,828,470	85	\$ 2,136,999	89	\$ 2,253,861
Indirects Costs 20.00%		14.25	\$ 358,996	14.51	\$ 365,694	16.96	\$ 427,400	17.89	\$ 450,772
TOTAL COST - VARIABLE SCOPES		85	\$ 2,153,978	87	\$ 2,194,164	102	\$ 2,564,399	107	\$ 2,704,633
TOTAL COST - ALL SCOPE		484	\$ 12,196,250	486	\$ 12,236,436	500	\$ 12,606,670	506	\$ 12,746,905
+/- to baseline				\$ 40,186		\$ 410,420		\$ 550,655	
% change to baseline - on TOTAL COST		NA		0.33%		3.37%		4.51%	
+/- to lowest cost				\$ 40,186		\$ 410,420		\$ 550,655	
% change to lowest cost - on TOTAL COST		NA		0.33%		3.37%		4.51%	



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
13 SMALL OFFICE - Base Case - IECC2018			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	25,200 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	12,600 sf	359,100	28.50 /sf
07-50 MEMBRANE ROOFING	25,200 SF	359,100	14.25 /SF
08-41 FACADE			
Insulation - 2" mineral wool	7,176 sf	30,498	4.25 /sf
Composite wall panels - including subframe	7,176 sf	574,080	80.00 /sf
Exterior doors	3 EA	15,000	5,000.00 /EA
Windows	4,784 sf	454,480	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
08-41 FACADE	25,200 SF	1,074,058	42.62 /SF
13 SMALL OFFICE - Base Case - IECC2018	25,200 SF	1,433,158	56.87 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
14 SMALL OFFICE - Base Case - IECC2021			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	25,200 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	12,600 sf	359,100	28.50 /sf
07-50 MEMBRANE ROOFING	25,200 SF	359,100	14.25 /SF
08-41 FACADE			
Insulation - 2" mineral wool	7,176 sf	30,498	4.25 /sf
Composite wall panels - including subframe	7,176 sf	574,080	80.00 /sf
Exterior doors	3 EA	15,000	5,000.00 /EA
Windows	4,784 sf	454,480	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	4,784 sf	28,704	6.00 /sf
- premium - argon - (1) cavity	4,784 sf	4,784	1.00 /sf
08-41 FACADE	25,200 SF	1,107,546	43.95 /SF
14 SMALL OFFICE - Base Case - IECC2021	25,200 SF	1,466,646	58.20 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
15 SMALL OFFICE - Optimized (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	25,200 sf	25,200	1.00 /sf
01-30 GENERAL CONDITIONS	25,200 SF	40,200	1.60 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	lf		/lf
Thermal isolation pads at dunnage	25,200 sf	25,200	1.00 /sf
05-12 STRUCTURAL STEEL	25,200 SF	25,200	1.00 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	12,600 sf	359,100	28.50 /sf
- premium - R-45	12,600 sf	44,100	3.50 /sf
07-50 MEMBRANE ROOFING	25,200 SF	403,200	16.00 /SF
08-41 FACADE			
Insulation - 2" mineral wool	7,176 sf	30,498	4.25 /sf
'-premium - 5"	7,176 sf	26,910	3.75 /sf
Composite wall panels - including subframe	7,176 sf	574,080	80.00 /sf
-premium - thermally broken clips	7,176 sf	107,640	15.00 /sf
Exterior doors	3 EA	15,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,500	500.00 /EA
Windows	4,784 sf	454,480	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	4,784 sf	28,704	6.00 /sf
- premium - argon - (1) cavity	4,784 sf	4,784	1.00 /sf
08-41 FACADE	25,200 SF	1,243,596	49.35 /SF
15 SMALL OFFICE - Optimized (Gas & Electric)	25,200 SF	1,712,196	67.94 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
17 SMALL OFFICE - Passive House (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	25,200 sf	25,200	1.00 /sf
01-30 GENERAL CONDITIONS	25,200 SF	40,200	1.60 /SF
05-12 STRUCTURAL STEEL			
<i>Thermal break at parapet structure</i>	<i>lf</i>		<i>/lf</i>
Thermal isolation pads at dunnage	25,200 sf	25,200	1.00 /sf
05-12 STRUCTURAL STEEL	25,200 SF	25,200	1.00 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	12,600 sf	359,100	28.50 /sf
- premium - R-45	12,600 sf	44,100	3.50 /sf
07-50 MEMBRANE ROOFING	25,200 SF	403,200	16.00 /SF
08-41 FACADE			
Insulation - 2" mineral wool	7,176 sf	30,498	4.25 /sf
'-premium - 5"	7,176 sf	26,910	3.75 /sf
Composite wall panels - including subframe	7,176 sf	574,080	80.00 /sf
-premium - thermally broken clips	7,176 sf	107,640	15.00 /sf
Exterior doors	3 EA	15,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	3 EA	1,500	500.00 /EA
Windows	4,784 sf	454,480	95.00 /sf
<i>-double glazing</i>	<i>incl</i>		<i>/incl</i>
- premium - triple pane - glass assembly	4,784 sf	131,560	27.50 /sf
-non-metal spacers	4,784 sf	9,568	2.00 /sf
<i>-low e - (1) surface</i>	<i>incl</i>		<i>/incl</i>
- premium - (1) additional low-e surface	4,784 sf	28,704	6.00 /sf
- premium - argon - (1) cavity	4,784 sf	9,568	2.00 /sf
<i>-thermal pads at windows perimeters - not required per SWA</i>	<i>lf</i>		<i>/lf</i>
-fiberglass/thermally broken frames	4,784 sf	95,680	20.00 /sf
08-41 FACADE	25,200 SF	1,485,188	58.94 /SF
17 SMALL OFFICE - Passive House (Gas & Electric)	25,200 SF	1,953,788	77.53 /SF



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
64 SMALL OFFICE - Base Case - IECC2018			
22-01 PLUMBING			
Natural gas distribution	25,200 sf	6,615	0.26 /sf
22-01 PLUMBING	25,200 sf	6,615	0.26 /sf
23-01 HVAC			
Constant air volume box (1/1000 SF)	25 ea	26,559	1,062.37 /ea
AHU (CV/gas heat/ DX cool) (5-unit)	25,000 cfm	262,500	10.50 /cfm
23-01 HVAC	25,200 sf	289,059	11.47 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	66,150	2.63 /sf
26-01 ELECTRICAL	25,200 sf	66,150	2.63 /sf
64 SMALL OFFICE - Base Case - IECC2018	25,200 sf	361,824	14.36 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
65 SMALL OFFICE - Base Case - IECC2021			
22-01 PLUMBING			
Natural gas distribution	25,200 sf	6,615	0.26 /sf
22-01 PLUMBING	73,960 sf	6,615	0.09 /sf
23-01 HVAC			
Constant air volume box (1/1000 SF)	25 ea	26,559	1,062.37 /ea
AHU (CV/gas heat/ DX cool) (5-unit)	25,000 cfm	262,500	10.50 /cfm
23-01 HVAC	25,200 sf	289,059	11.47 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	66,150	2.63 /sf
26-01 ELECTRICAL	25,200 sf	66,150	2.63 /sf
65 SMALL OFFICE - Base Case - IECC2021	25,200 sf	361,824	14.36 /sf



Stretch Code Study
MEP's Pricing Backup

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
66 SMALL OFFICE - Optimized - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution	25,200 sf	3,969	0.16 /sf
22-01 PLUMBING	25,200 sf	3,969	0.16 /sf
23-01 HVAC			
Constant air volume box (1/1000 SF)	25 ea	26,559	1,062.37 /ea
AHU (CV/gas heat/ DX cool) (5-units)	25,000 cfm	262,500	10.50 /cfm
DOAS (VAV/gas heat/DX cool/economizer/ER wheel) (1-unit)	5,000 cfm	65,625	13.13 /cfm
23-01 HVAC	25,200 sf	354,684	14.08 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	66,150	2.63 /sf
26-01 ELECTRICAL	25,200 sf	66,150	2.63 /sf
66 SMALL OFFICE - Optimized - Gas-Heat	25,200 sf	424,803	16.86 /sf



Stretch Code Study
MEP's Pricing Backup

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
67 SMALL OFFICE - Optimized - Electric-Heat			
23-01 HVAC			
Refrigerant piping distribution	25,200 sf	151,200	6.00 /sf
AC condensate piping distribuiton	25,200 sf	25,200	1.00 /sf
DOAS (VAV/gas heat/DX cool/economizer/ER wheel) (1-unit)	5,000 cfm	65,625	13.13 /cfm
VRF/Indoor units/ducted horiz.	23 ea	61,890	2,690.88 /ea
VRF/Outdoor cond. unit/heat & cool - 144 mbh	5 ea	135,369	27,073.76 /ea
VRF/Main-branch circuit controller/max. 10-indoor units	3 ea	23,001	7,666.88 /ea
23-01 HVAC	25,200 sf	462,285	18.35 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	79,380	3.15 /sf
26-01 ELECTRICAL	25,200 sf	79,380	3.15 /sf
67 SMALL OFFICE - Optimized - Electric-Heat	25,200 sf	541,665	21.50 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
68 SMALL OFFICE - Passive House - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution	25,200 sf	3,969	0.16 /sf
22-01 PLUMBING	73,960 sf	3,969	0.05 /sf
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	2,500 cfm	20,000	8.00 /cfm
Constant air volume box (1/1000 SF)	25 ea	26,559	1,062.37 /ea
DOAS (VAV/gas heat/DX cool/economizer/ER wheel) (1-unit)	5,000 cfm	65,625	13.13 /cfm
AHU (CV/gas heat/ DX cool) (5-unit)	25,000 cfm	288,750	11.55 /cfm
23-01 HVAC	73,960 sf	400,934	5.42 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	66,150	2.63 /sf
26-01 ELECTRICAL	73,960 sf	66,150	0.89 /sf
68 SMALL OFFICE - Passive House - Gas-Heat	73,960 sf	471,053	6.37 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
69 SMALL OFFICE - Passive House - Electric-Heat			
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	2,500 cfm	20,000	8.00 /cfm
Refrigerant piping distribution	25,200 sf	151,200	6.00 /sf
AC condensate piping distribuiton	25,200 sf	25,200	1.00 /sf
DOAS (VAV/gas heat/DX cool/economizer/ER wheel) (1-unit)	5,000 cfm	65,625	13.13 /cfm
VRF/Indoor units/ non-ducted	23 ea	61,890	2,690.88 /ea
VRF/Outdoor cond. unit/heat & cool - 144 mbh	5 ea	135,369	27,073.76 /ea
VRF/Main-branch circuit controller/max. 10-indoor units	3 ea	23,001	7,666.88 /ea
23-01 HVAC	73,960 sf	482,285	6.52 /sf
26-01 ELECTRICAL			
Mechanical power & connection	25,200 sf	79,380	3.15 /sf
26-01 ELECTRICAL	73,960 sf	79,380	1.07 /sf
69 SMALL OFFICE - Passive House - Electric-Heat	73,960 sf	561,665	7.59 /sf

PRIMARY SCHOOL

MA DOER - Stretch Code Study
Primary School - BASELINE COST

June 11, 2021



WBS	DESCRIPTION	Total Cost 73,960 SF	
01-10	Testing	-	\$ -
01-50	Temporary Hoist		\$ -
01-55	Winter Conditions	3.00	\$ 222,000
01-60	Final Cleaning	1.00	\$ 74,000
03-30	Concrete	25.00	\$ 1,849,000
04-20	Masonry	10.00	\$ 740,000
05-12	Structural Steel - base scope	32.00	\$ 2,367,000
	Structural Steel - variable scope	-	\$ -
05-50	Miscellaneous Metals	8.00	\$ 592,000
06-25	Architectural Millwork/Casework	8.00	\$ 592,000
07-10	Waterproofing/Caulking	5.00	\$ 370,000
07-50	Roofing & Sheet Metal - base scope	2.00	\$ 148,000
	Roofing & Sheet Metal - variable scope	15.40	\$ 1,139,000
07-81	Fireproofing	2.50	\$ 185,000
08-10	Doors, Frames, Hardware	6.00	\$ 444,000
08-36	Overhead Doors	0.50	\$ 37,000
08-41	Façade	32.44	\$ 2,399,000
08-80	Interior Aluminum, Glass & Glazing	9.00	\$ 666,000
09-21	Drywall - base scope	34.00	\$ 2,515,000
	Drywall - variable scope	-	\$ -
09-30	Tile	2.00	\$ 148,000
09-51	Acoustical Ceilings	6.50	\$ 481,000
09-54	Specialty Ceilings	1.00	\$ 74,000
09-60	Floors	8.00	\$ 592,000
09-90	Painting	5.00	\$ 370,000
10-01	Typical Specialties	2.00	\$ 148,000
10-14	Signage	0.10	\$ 7,000
10-95	Misc. Specialties	4.00	\$ 296,000
11-12	Parking Equipment		\$ -
11-24	Window Washing Equipment		\$ -
11-40	Food Service Equipment	6.00	\$ 444,000
11-95	Other Equipment	3.00	\$ 222,000
14-20	Elevators	8.11	\$ 600,000
21-01	Fire Protection	6.50	\$ 481,000
22-01	Plumbing - base scope	15.00	\$ 1,109,000
	Plumbing - variable scope	0.26	\$ 19,000
23-01	HVAC - base scope	38.00	\$ 2,810,000
	HVAC - variable scope	24.04	\$ 1,778,000
26-01	Electrical - base scope	42.00	\$ 3,106,000
	Electrical - variable scope	3.68	\$ 272,000
31-23	Site Work	20.00	\$ 1,479,000
31-24	Piles		\$ -
31-41	Support of Excavation (SOE)		\$ -
32-10	Landscaping & Site Improvements	10.00	\$ 740,000
32-31	Fencing		\$ -
33-10	Utilities	6.00	\$ 444,000
SUBTOTAL		405	\$ 29,959,000
	Indirects Costs	81.01	\$ 5,991,800
TOTAL COST		486	\$ 35,950,800



		BASE CASE - IECC2018		BASE CASE - IECC2021		OPTIMIZED		PASSIVE HOUSE	
		Gas Heat		Gas Heat		Gas Heat		Electric Heat	
WBS	DESCRIPTION	Total Cost 73,960 SF		Total Cost 73,960 SF		Total Cost 73,960 SF		Total Cost 73,960 SF	
01-10	Testing	-	\$ -	-	\$ -	0.95	\$ 70,470	0.95	\$ 70,470
05-12	Structural Steel	-	\$ -	-	\$ -	0.54	\$ 39,968	0.54	\$ 39,968
07-50	Roofing & Sheet Metal	15.40	\$ 1,139,088	15.40	\$ 1,139,088	17.29	\$ 1,278,976	17.29	\$ 1,278,976
08-41	Façade	32.44	\$ 2,399,247	33.43	\$ 2,472,173	36.45	\$ 2,695,614	43.98	\$ 3,252,977
09-21	Drywall	-	\$ -	-	\$ -	-	\$ -	-	\$ -
SUBTOTAL (Architectural)		48	\$ 3,538,335	49	\$ 3,611,261	55	\$ 4,085,028	55	\$ 4,085,028
Back Up Item #		18		19		20		20	
22-01	Plumbing	0.26	\$ 19,415	0.26	\$ 19,415	0.26	\$ 19,415	-	\$ -
23-01	HVAC	24.04	\$ 1,777,796	23.42	\$ 1,731,821	21.04	\$ 1,555,983	26.84	\$ 1,985,385
26-01	Electrical	3.68	\$ 271,803	3.68	\$ 271,803	3.68	\$ 271,803	4.20	\$ 310,632
SUBTOTAL (MEP)		28	\$ 2,069,014	27	\$ 2,023,039	25	\$ 1,847,201	31	\$ 2,296,017
Back Up Item #		68		69		70		71	
SUBTOTAL		76	\$ 5,607,349	76	\$ 5,634,300	80	\$ 5,932,229	86	\$ 6,381,045
Indirects Costs 20.00%		15.16	\$ 1,121,470	15.24	\$ 1,126,860	16.04	\$ 1,186,446	17.26	\$ 1,276,209
TOTAL COST - VARIABLE SCOPES		91	\$ 6,728,819	91	\$ 6,761,160	96	\$ 7,118,675	104	\$ 7,657,254
TOTAL COST - ALL SCOPE		486	\$ 35,950,800	487	\$ 35,983,141	491	\$ 36,340,656	499	\$ 36,879,235



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
23 SECONDARY SCHOOL - Base Case - IECC2018			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	328,000 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	130,046 sf	3,706,311	28.50 /sf
07-50 MEMBRANE ROOFING	328,000 SF	3,706,311	11.30 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	73,561 sf	2,942,440	40.00 /sf
Relieving angles - premium for thermally broken	lf		/lf
Insulation - 2" mineral wool	73,561 sf	312,634	4.25 /sf
Exterior doors	20 EA	100,000	5,000.00 /EA
Windows	39,610 sf	3,762,950	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
-operable premium - 35% of glazing, assume 30sf/ea	462 ea	462,000	1,000.00 /ea
08-41 FACADE	328,000 SF	7,580,024	23.11 /SF
23 SECONDARY SCHOOL - Base Case - IECC2018	328,000 SF	11,286,335	34.41 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
24 SECONDARY SCHOOL - Base Case - IECC2021			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	328,000 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	130,046 sf	3,706,311	28.50 /sf
07-50 MEMBRANE ROOFING	328,000 SF	3,706,311	11.30 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	73,561 sf	2,942,440	40.00 /sf
Relieving angles - premium for thermally broken	lf		/lf
Insulation - 2" mineral wool	73,561 sf	312,634	4.25 /sf
Exterior doors	20 EA	100,000	5,000.00 /EA
Windows	39,610 sf	3,762,950	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
-operable premium - 35% of glazing, assume 30sf/ea	462 ea	462,000	1,000.00 /ea
- premium - (1) additional low-e surface	10,418 sf	62,508	6.00 /sf
- premium - argon - (1) cavity	10,418 sf	10,418	1.00 /sf
08-41 FACADE	328,000 SF	7,652,950	23.33 /SF
24 SECONDARY SCHOOL - Base Case - IECC2021	328,000 SF	11,359,261	34.63 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
25 SECONDARY SCHOOL - Optimized (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	328,000 sf	164,000	0.50 /sf
01-30 GENERAL CONDITIONS	328,000 SF	179,000	0.55 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	lf		/lf
Thermal isolation pads at dunnage	130,046 sf	130,046	1.00 /sf
05-12 STRUCTURAL STEEL	328,000 SF	130,046	0.40 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	130,046 sf	3,706,311	28.50 /sf
- premium - R-45	130,046 sf	455,161	3.50 /sf
07-50 MEMBRANE ROOFING	328,000 SF	4,161,472	12.69 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	73,561 sf	2,942,440	40.00 /sf
Relieving angles - premium for thermally broken	6,295 lf	314,750	50.00 /lf
Insulation - 2" mineral wool	73,561 sf	312,634	4.25 /sf
'-premium - 5"	73,561 sf	275,854	3.75 /sf
Exterior doors	20 EA	100,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	20 EA	10,000	500.00 /EA
Windows	39,610 sf	3,762,950	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	39,610 sf	237,660	6.00 /sf
- premium - argon - (1) cavity	39,610 sf	39,610	1.00 /sf
-operable premium - 35% of glazing, assume 30sf/ea	462 ea	462,000	1,000.00 /ea
-premium for improved gasketing & hardware for air leakage	462 ea	138,600	300.00 /ea
08-41 FACADE	328,000 SF	8,596,498	26.21 /SF
25 SECONDARY SCHOOL - Optimized (Gas & Electric)	328,000 SF	13,067,016	39.84 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
27 SECONDARY SCHOOL - Passive House (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	328,000 sf	164,000	0.50 /sf
01-30 GENERAL CONDITIONS	328,000 SF	179,000	0.55 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	lf		/lf
Thermal isolation pads at dunnage	130,046 sf	130,046	1.00 /sf
05-12 STRUCTURAL STEEL	328,000 SF	130,046	0.40 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	130,046 sf	3,706,311	28.50 /sf
- premium - R-45	130,046 sf	455,161	3.50 /sf
07-50 MEMBRANE ROOFING	328,000 SF	4,161,472	12.69 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	73,561 sf	2,942,440	40.00 /sf
Relieving angles - premium for thermally broken	6,295 lf	314,750	50.00 /lf
Insulation - 2" mineral wool	73,561 sf	312,634	4.25 /sf
'-premium - 5"	73,561 sf	275,854	3.75 /sf
Exterior doors	20 EA	100,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	20 EA	10,000	500.00 /EA
Windows	39,610 sf	3,762,950	95.00 /sf
-double glazing	incl		/incl
- premium - triple pane - glass assembly	39,610 sf	1,089,275	27.50 /sf
-non-metal spacers	39,610 sf	198,050	5.00 /sf
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	39,610 sf	237,660	6.00 /sf
- premium - argon - (1) cavity	39,610 sf	79,220	2.00 /sf
-operable premium - 35% of glazing, assume 30sf/ea	462 ea	462,000	1,000.00 /ea
-premium for improved gasketing & hardware for air leakage	462 ea	138,600	300.00 /ea
-thermal pads at windows perimeters - not required per SWA	lf		/lf
-fiberglass/thermally broken frames	39,610 sf	792,200	20.00 /sf
08-41 FACADE	328,000 SF	10,715,633	32.67 /SF
27 SECONDARY SCHOOL - Passive House (Gas & Electric)	328,000 SF	15,186,151	46.30 /SF



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
70 PRIMARY SCHOOL - Base Case - IECC2018			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	73,960 sf	19,415	0.26 /sf
22-01 PLUMBING	73,960 sf	19,415	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	73,960 sf	73,960	1.00 /sf
Perimeter radiation piping distrubtion	73,960 sf	147,920	2.00 /sf
Hydronic piping connections @ VAV's	100 ea	137,840	1,378.40 /ea
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
Variable air volume box w coil (1/750 sf)	100 ea	131,647	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 1,300 mbh	2 ea	54,184	27,092.00 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 50%)	5,000 cfm	65,625	13.13 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 50%)	4,000 cfm	52,500	13.13 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 50%)	18,000 cfm	236,250	13.13 /cfm
AHU-pod 2 (VAV/hw&cw coil/economizer/ER 50%)	16,000 cfm	210,000	13.13 /cfm
AHU-common (VAV/hw&cw coil/economizer/ER 50%)	13,000 cfm	170,625	13.13 /cfm
Finned-tube radiation w/enclosure	2,200 lf	447,134	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	73,960 sf	1,777,796	24.04 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	271,803	3.68 /sf
26-01 ELECTRICAL	73,960 sf	271,803	3.68 /sf
70 PRIMARY SCHOOL - Base Case - IECC2018	73,960 sf	2,069,013	27.98 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
71 PRIMARY SCHOOL - Base Case - IECC2021			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	73,960 sf	19,415	0.26 /sf
22-01 PLUMBING	328,000 sf	19,415	0.06 /sf
23-01 HVAC			
ATC - Fintube radiation zones	73,960 sf	73,960	1.00 /sf
Perimeter radiation piping distrubtion	73,960 sf	147,920	2.00 /sf
Hydronic piping connections @ VAV's	100 ea	137,840	1,378.40 /ea
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
Variable air volume box w coil (1/750 sf)	100 ea	131,647	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 1,100 mbh	2 ea	47,584	23,792.00 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 50%)	5,000 cfm	65,625	13.13 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 50%)	4,000 cfm	52,500	13.13 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 50%)	17,000 cfm	223,125	13.13 /cfm
AHU-pod 2 (VAV/hw&cw coil/economizer/ER 50%)	15,000 cfm	196,875	13.13 /cfm
AHU-common (VAV/hw&cw coil/economizer/ER 50%)	12,000 cfm	157,500	13.13 /cfm
Finned-tube radiation w/enclosure	2,200 lf	447,134	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	73,960 sf	1,731,821	23.42 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	271,803	3.68 /sf
26-01 ELECTRICAL	73,960 sf	271,803	3.68 /sf
71 PRIMARY SCHOOL - Base Case - IECC2021	73,960 sf	2,023,038	27.35 /sf

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
72 PRIMARY SCHOOL - Optimized - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	73,960 sf	19,415	0.26 /sf
22-01 PLUMBING	73,960 sf	19,415	0.26 /sf
23-01 HVAC			
ATC - Fintube radiation zones	73,960 sf	55,470	0.75 /sf
Perimeter radiation piping distrubtion	73,960 sf	110,940	1.50 /sf
Hydronic piping connections @ VAV's	100 ea	137,840	1,378.40 /ea
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
Variable air volume box w coil (1/750 sf)	100 ea	131,647	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 700 mbh	2 ea	34,384	17,192.00 /ea
AHU-cafeteria (VAV/hw&cw coil/economizer/ER 75%)	5,000 cfm	76,125	15.23 /cfm
AHU-gym (VAV/hw&cw coil/economizer/ER 75%)	4,000 cfm	60,900	15.23 /cfm
AHU-kitchen (VAV/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 75%)	17,000 cfm	258,825	15.23 /cfm
AHU-pod 2 (VAV/hw&cw coil/economizer/ER 75%)	15,000 cfm	228,375	15.23 /cfm
AHU-common (VAV/hw&cw coil/economizer/ER 75%)	11,000 cfm	167,475	15.23 /cfm
Finned-tube radiation w/enclosure	1,200 lf	243,891	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	73,960 sf	1,555,983	21.04 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	271,803	3.68 /sf
26-01 ELECTRICAL	73,960 sf	271,803	3.68 /sf
72 PRIMARY SCHOOL - Optimized - Gas-Heat	73,960 sf	1,847,201	24.98 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
73 PRIMARY SCHOOL - Optimized - Electric-Heat			
23-01 HVAC			
Refrigerant piping distribution	73,960 sf	887,520	12.00 /sf
AC condensate piping distribuiton	73,960 sf	92,450	1.25 /sf
Sheetmetal & accessories/galvanized (reduce duct for cassetts in classroom)	(73,960) sf	(147,920)	2.00 /sf
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 75%)	5,000 cfm	76,125	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 75%)	4,000 cfm	60,900	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 75%)	10,000 cfm	162,750	16.28 /cfm
AHU-pod 2 (DOAS/hw&cw coil/economizer/ER 75%)	9,000 cfm	146,475	16.28 /cfm
AHU-common (DOAS/hw&cw coil/economizer/ER 75%)	6,000 cfm	97,650	16.28 /cfm
VRF/Indoor units/4-way clg. csstt (classroom)	74 ea	173,929	2,350.40 /ea
VRF/Indoor units/4-way clg. csstt (misc. areas, 1 unit/750 sf)	30 ea	70,512	2,350.40 /ea
VRF/Outdoor cond. units (2)/heat or cool - 180 mbh	7 ea	241,491	34,498.76 /ea
VRF/Main-branch circuit controller/max. 10-indoor units	12 ea	92,003	7,666.88 /ea
23-01 HVAC	73,960 sf	1,985,385	26.84 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	310,632	4.20 /sf
26-01 ELECTRICAL	73,960 sf	310,632	4.20 /sf
73 PRIMARY SCHOOL - Optimized - Electric-Heat	73,960 sf	2,296,017	31.04 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
74 PRIMARY SCHOOL - Passive House - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (2-boilers)	73,960 sf	19,415	0.26 /sf
22-01 PLUMBING	328,000 sf	19,415	0.06 /sf
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	6,000 cfm	48,000	8.00 /cfm
ATC - Fintube radiation zones	73,960 sf	55,470	0.75 /sf
Perimeter radiation piping distrubtion	73,960 sf	110,940	1.50 /sf
Hydronic piping connections @ VAV's	100 ea	137,840	1,378.40 /ea
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
Variable air volume box w coil (1/750 sf)	100 ea	131,647	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 500 mbh	2 ea	27,784	13,892.00 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 80%)	5,000 cfm	76,125	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 80%)	4,000 cfm	60,900	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 80%)	16,000 cfm	243,600	15.23 /cfm
AHU-pod 2 (VAV/hw&cw coil/economizer/ER 80%)	15,000 cfm	228,375	15.23 /cfm
AHU-common (VAV/hw&cw coil/economizer/ER 80%)	11,000 cfm	167,475	15.23 /cfm
Finned-tube radiation w/enclosure	820 lf	166,659	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	328,000 sf	1,504,926	4.59 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	271,803	3.68 /sf
26-01 ELECTRICAL	328,000 sf	271,803	0.83 /sf
74 PRIMARY SCHOOL - Passive House - Gas-Heat	328,000 sf	1,796,144	5.48 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
75 PRIMARY SCHOOL - Passive House - Electric-Heat			
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	6,000 cfm	48,000	8.00 /cfm
Refrigerant piping distribution	73,960 sf	887,520	12.00 /sf
AC condensate piping distribuiton	73,960 sf	92,450	1.25 /sf
Sheetmetal & accessories/galvanized (reduce duct for cassets in classroom)	(73,960) sf	(147,920)	2.00 /sf
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 80%)	5,000 cfm	76,125	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 80%)	4,000 cfm	60,900	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 80%)	10,000 cfm	162,750	16.28 /cfm
AHU-pod 2 (DOAS/hw&cw coil/economizer/ER 80%)	9,000 cfm	146,475	16.28 /cfm
AHU-common (DOAS/hw&cw coil/economizer/ER 80%)	6,000 cfm	97,650	16.28 /cfm
VRF/Indoor units/4-way clg. csstt (classroom)	74 ea	173,929	2,350.40 /ea
VRF/Indoor units/4-way clg. csstt (misc. areas, 1 unit/750 sf)	30 ea	70,512	2,350.40 /ea
VRF/Outdoor cond. units (2)/heat or cool - 180 mbh	7 ea	241,491	34,498.76 /ea
VRF/Main-branch circuit controller/max. 10-indoor units	12 ea	92,003	7,666.88 /ea
23-01 HVAC	328,000 sf	2,033,385	6.20 /sf
26-01 ELECTRICAL			
Mechanical power & connection	73,960 sf	310,632	4.20 /sf
26-01 ELECTRICAL	328,000 sf	310,632	0.95 /sf
75 PRIMARY SCHOOL - Passive House - Electric-Heat	328,000 sf	2,344,017	7.15 /sf



CONSIGLI
Est. 1905

SECONDARY SCHOOL

MA DOER - Stretch Code Study
Secondary School - BASELINE COST

June 11, 2021



WBS	DESCRIPTION	Total Cost 328,000 SF	
01-10	Testing	-	\$ -
01-50	Temporary Hoist	\$	-
01-55	Winter Conditions	3.00	\$ 984,000
01-60	Final Cleaning	1.00	\$ 328,000
03-30	Concrete	30.00	\$ 9,840,000
04-20	Masonry	10.00	\$ 3,280,000
05-12	Structural Steel - base scope	37.50	\$ 12,300,000
	Structural Steel - variable scope	-	\$ -
05-50	Miscellaneous Metals	9.00	\$ 2,952,000
06-25	Architectural Millwork/Casework	8.00	\$ 2,624,000
07-10	Waterproofing/Caulking	5.00	\$ 1,640,000
07-50	Roofing & Sheet Metal - base scope	1.00	\$ 328,000
	Roofing & Sheet Metal - variable scope	11.30	\$ 3,706,000
07-81	Fireproofing	2.50	\$ 820,000
08-10	Doors, Frames, Hardware	6.00	\$ 1,968,000
08-36	Overhead Doors	0.50	\$ 164,000
08-41	Façade	23.11	\$ 7,580,000
08-80	Interior Aluminum, Glass & Glazing	10.00	\$ 3,280,000
09-21	Drywall - base scope	36.00	\$ 11,808,000
	Drywall - variable scope	-	\$ -
09-30	Tile	2.50	\$ 820,000
09-51	Acoustical Ceilings	6.00	\$ 1,968,000
09-54	Specialty Ceilings	2.00	\$ 656,000
09-60	Floors	10.00	\$ 3,280,000
09-90	Painting	5.00	\$ 1,640,000
10-01	Typical Specialties	2.00	\$ 656,000
10-14	Signage	0.10	\$ 33,000
10-95	Misc. Specialties	5.00	\$ 1,640,000
11-12	Parking Equipment	\$	-
11-24	Window Washing Equipment	\$	-
11-40	Food Service Equipment	6.00	\$ 1,968,000
11-95	Other Equipment	3.00	\$ 984,000
14-20	Elevators	1.83	\$ 600,000
21-01	Fire Protection	6.50	\$ 2,132,000
22-01	Plumbing - base scope	17.00	\$ 5,576,000
	Plumbing - variable scope	0.16	\$ 52,000
23-01	HVAC - base scope	52.00	\$ 17,056,000
	HVAC - variable scope	21.67	\$ 7,109,000
26-01	Electrical - base scope	48.00	\$ 15,744,000
	Electrical - variable scope	3.15	\$ 1,033,000
31-23	Site Work	35.00	\$ 11,480,000
31-24	Piles	\$	-
31-41	Support of Excavation (SOE)	\$	-
32-10	Landscaping & Site Improvements	12.00	\$ 3,936,000
32-31	Fencing	\$	-
33-10	Utilities	5.00	\$ 1,640,000
SUBTOTAL		438	\$ 143,605,000
	Indirects Costs	20.00%	87.56 \$ 28,721,000
TOTAL COST		525	\$ 172,326,000



		BASE CASE - IECC2018		BASE CASE - IECC2021		OPTIMIZED		PASSIVE HOUSE	
		Gas Heat		Gas Heat		Gas Heat		Electric Heat	
		Total Cost 328,000 SF		Total Cost 328,000 SF		Total Cost 328,000 SF		Total Cost 328,000 SF	
WBS	DESCRIPTION								
01-10	Testing	-	\$ -	-	\$ -	0.55	\$ 179,000	0.55	\$ 179,000
05-12	Structural Steel	-	\$ -	-	\$ -	0.40	\$ 130,046	0.40	\$ 130,046
07-50	Roofing & Sheet Metal	11.30	\$ 3,706,311	11.30	\$ 3,706,311	12.69	\$ 4,161,472	12.69	\$ 4,161,472
08-41	Façade	23.11	\$ 7,580,024	23.33	\$ 7,652,950	26.21	\$ 8,596,498	32.67	\$ 10,715,633
09-21	Drywall	-	\$ -	-	\$ -	-	\$ -	-	\$ -
SUBTOTAL (Architectural)		34	\$ 11,286,335	35	\$ 11,359,261	40	\$ 13,067,016	46	\$ 15,186,151
Back Up Item #		23		24		25		27	
22-01	Plumbing	0.16	\$ 51,660	0.16	\$ 51,660	0.11	\$ 34,440	0.11	\$ 34,440
23-01	HVAC	21.67	\$ 7,109,103	16.71	\$ 5,480,292	16.94	\$ 5,555,713	17.57	\$ 5,762,763
26-01	Electrical	3.15	\$ 1,033,200	3.15	\$ 1,033,200	3.15	\$ 1,033,200	3.15	\$ 1,033,200
SUBTOTAL (MEP)		25	\$ 8,193,963	20	\$ 6,565,152	20	\$ 6,623,353	22	\$ 7,327,640
Back Up Item #		74		75		76		78	
SUBTOTAL		59	\$ 19,480,298	55	\$ 17,924,413	60	\$ 19,690,369	62	\$ 20,394,656
Indirects Costs 20.00%		11.88	\$ 3,896,060	10.93	\$ 3,584,883	12.01	\$ 3,938,074	12.44	\$ 4,078,931
TOTAL COST - VARIABLE SCOPES		71	\$ 23,376,358	66	\$ 21,509,296	72	\$ 23,628,443	75	\$ 24,473,587
TOTAL COST - ALL SCOPE		525	\$ 172,326,000	520	\$ 170,458,938	526	\$ 172,578,085	529	\$ 173,423,230



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
18 PRIMARY SCHOOL - Base Case - IECC2018			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	73,960 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	39,968 sf	1,139,088	28.50 /sf
07-50 MEMBRANE ROOFING	73,960 SF	1,139,088	15.40 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	26,611 sf	1,064,440	40.00 /sf
Relieving angles - premium for thermally broken	lf		/lf
Insulation - 2" mineral wool	26,611 sf	113,097	4.25 /sf
Exterior doors	10 EA	50,000	5,000.00 /EA
Windows	10,418 sf	989,710	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
-operable premium - 35% of glazing, assume 20sf/ea	182 ea	182,000	1,000.00 /ea
08-41 FACADE	73,960 SF	2,399,247	32.44 /SF
18 PRIMARY SCHOOL - Base Case - IECC2018	73,960 SF	3,538,335	47.84 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
19 PRIMARY SCHOOL - Base Case - IECC2021			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	excl		/excl
Air leakage testing - allowance to set up	excl		/excl
01-30 GENERAL CONDITIONS	73,960 SF		/SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	39,968 sf	1,139,088	28.50 /sf
07-50 MEMBRANE ROOFING	73,960 SF	1,139,088	15.40 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	26,611 sf	1,064,440	40.00 /sf
Relieving angles - premium for thermally broken	lf		/lf
Insulation - 2" mineral wool	26,611 sf	113,097	4.25 /sf
Exterior doors	10 EA	50,000	5,000.00 /EA
Windows	10,418 sf	989,710	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
-operable premium - 35% of glazing, assume 20sf/ea	182 ea	182,000	1,000.00 /ea
- premium - (1) additional low-e surface	10,418 sf	62,508	6.00 /sf
- premium - argon - (1) cavity	10,418 sf	10,418	1.00 /sf
08-41 FACADE	73,960 SF	2,472,173	33.43 /SF
19 PRIMARY SCHOOL - Base Case - IECC2021	73,960 SF	3,611,261	48.83 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
20 PRIMARY SCHOOL - Optimized (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	73,960 sf	55,470	0.75 /sf
01-30 GENERAL CONDITIONS	73,960 SF	70,470	0.95 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	lf		/lf
Thermal isolation pads at dunnage	39,968 sf	39,968	1.00 /sf
05-12 STRUCTURAL STEEL	73,960 SF	39,968	0.54 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	39,968 sf	1,139,088	28.50 /sf
- premium - R-45	39,968 sf	139,888	3.50 /sf
07-50 MEMBRANE ROOFING	73,960 SF	1,278,976	17.29 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	26,611 sf	1,064,440	40.00 /sf
Relieving angles - premium for thermally broken	1,281 lf	64,050	50.00 /lf
Insulation - 2" mineral wool	26,611 sf	113,097	4.25 /sf
-premium - 5"	26,611 sf	99,791	3.75 /sf
Exterior doors	10 EA	50,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	10 EA	5,000	500.00 /EA
Windows	10,418 sf	989,710	95.00 /sf
-double glazing	incl		/incl
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	10,418 sf	62,508	6.00 /sf
- premium - argon - (1) cavity	10,418 sf	10,418	1.00 /sf
-operable premium - 35% of glazing, assume 20sf/ea	182 ea	182,000	1,000.00 /ea
-premium for improved gasketing & hardware for air leakage	182 ea	54,600	300.00 /ea
08-41 FACADE	73,960 SF	2,695,614	36.45 /SF
20 PRIMARY SCHOOL - Optimized (Gas & Electric)	73,960 SF	4,085,028	55.23 /SF



Stretch Code Study
Architectural/Structural Pricing Back Up

Description	Takeoff Quantity	Total Amount	Total Cost/Unit
22 PRIMARY SCHOOL - Passive House (Gas & Electric)			
01-30 GENERAL CONDITIONS			
Air leakage testing - consulting fee	1 ls	15,000	15,000.00 /ls
Air leakage testing - allowance to set up	73,960 sf	55,470	0.75 /sf
01-30 GENERAL CONDITIONS	73,960 SF	70,470	0.95 /SF
05-12 STRUCTURAL STEEL			
Thermal break at parapet structure	lf		/lf
Thermal isolation pads at dunnage	39,968 sf	39,968	1.00 /sf
05-12 STRUCTURAL STEEL	73,960 SF	39,968	0.54 /SF
07-50 MEMBRANE ROOFING			
Built-up roof - R-40, including all copings, flashings, etc	39,968 sf	1,139,088	28.50 /sf
- premium - R-45	39,968 sf	139,888	3.50 /sf
07-50 MEMBRANE ROOFING	73,960 SF	1,278,976	17.29 /SF
08-41 FACADE			
Brick veneer - standard size - running bond	26,611 sf	1,064,440	40.00 /sf
Relieving angles - premium for thermally broken	1,281 lf	64,050	50.00 /lf
Insulation - 2" mineral wool	26,611 sf	113,097	4.25 /sf
'-premium - 5"	26,611 sf	99,791	3.75 /sf
Exterior doors	10 EA	50,000	5,000.00 /EA
-premium for improved gasketing & hardware for air leakage	10 EA	5,000	500.00 /EA
Windows	10,418 sf	989,710	95.00 /sf
-double glazing	incl		/incl
- premium - triple pane - glass assembly	10,418 sf	286,495	27.50 /sf
-non-metal spacers	10,418 sf	52,090	5.00 /sf
-low e - (1) surface	incl		/incl
- premium - (1) additional low-e surface	10,418 sf	62,508	6.00 /sf
- premium - argon - (1) cavity	10,418 sf	20,836	2.00 /sf
-operable premium - 35% of glazing, assume 20sf/ea	182 ea	182,000	1,000.00 /ea
-premium for improved gasketing & hardware for air leakage	182 ea	54,600	300.00 /ea
-thermal pads at windows perimeters - not required per SWA	lf		/lf
-fiberglass/thermally broken frames	10,418 sf	208,360	20.00 /sf
08-41 FACADE	73,960 SF	3,252,977	43.98 /SF
22 PRIMARY SCHOOL - Passive House (Gas & Electric)	73,960 SF	4,642,391	62.77 /SF



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
76 SECONDARY SCHOOL - Base Case - IECC2018			
22-01 PLUMBING			
Natural gas distribution (3-boilers)	328,000 sf	51,660	0.16 /sf
22-01 PLUMBING	328,000 sf	51,660	0.16 /sf
23-01 HVAC			
ATC - Fintube radiation zones	328,000 sf	328,000	1.00 /sf
Perimeter radiation piping distrubtion	328,000 sf	656,000	2.00 /sf
Hydronic piping connections @ VAV's	437 ea	602,361	1,378.40 /ea
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
Variable air volume box w coil (1/750 sf)	437 ea	575,295	1,316.47 /ea
Boiler/HW/gas/high eff. cond. - 1,500 mbh	3 ea	91,176	30,392.00 /ea
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 70%)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 70%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 70%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 70%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 70%) (4-units)	150,000 cfm	2,283,750	15.23 /cfm
Finned-tube radiation w/enclosure	6,400 lf	1,300,752	203.24 /lf
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	328,000 sf	7,109,103	21.67 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,033,200	3.15 /sf
26-01 ELECTRICAL	328,000 sf	1,033,200	3.15 /sf
76 SECONDARY SCHOOL - Base Case - IECC2018	328,000 sf	8,193,963	24.98 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
77 SECONDARY SCHOOL - Base Case - IECC2021			
22-01 PLUMBING			
Natural gas distribution (3-boilers)	328,000 sf	51,660	0.16 /sf
22-01 PLUMBING	328,000 sf	51,660	0.16 /sf
23-01 HVAC			
Hydronic piping connections @ FCU's	273 ea	649,767	2,380.10 /ea
Additional CHW loop	328,000 sf	820,000	2.50 /sf
HW pump/base mount/8 hp	2 ea	11,497	5,748.40 /ea
AC condensate piping distribuiton	328,000 sf	410,000	1.25 /sf
Boiler/HW/gas/high eff. cond. - 1,300 mbh	3 ea	81,276	27,092.00 /ea
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 70%) (2-units)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 70%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 70%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 70%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (VAV/hw&cw coil/economizer/ER 70%) (4-units)	78,000 cfm	1,187,550	15.23 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (classroom)	149 ea	506,657	3,400.38 /ea
Fan coil unit/hydronic 4-pipe/ducted (misc. areas, 1 unit/1,000 sf)	124 ea	553,273	4,461.88 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 8 hp (HW pumps)	2 ea	7,115	3,557.47 /ea
23-01 HVAC	328,000 sf	5,480,292	16.71 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,033,200	3.15 /sf
26-01 ELECTRICAL	328,000 sf	1,033,200	3.15 /sf
77 SECONDARY SCHOOL - Base Case - IECC2021	328,000 sf	6,565,152	20.02 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
78 SECONDARY SCHOOL - Optimized - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (3-boilers)	328,000 sf	34,440	0.11 /sf
22-01 PLUMBING	328,000 sf	34,440	0.11 /sf
23-01 HVAC			
Hydronic piping connections @ FCU's	273 ea	649,767	2,380.10 /ea
Additional CHW loop	328,000 sf	820,000	2.50 /sf
HW pump/base mount/6 hp	2 ea	10,617	5,308.40 /ea
AC condensate piping distribuiton	328,000 sf	410,000	1.25 /sf
Boiler/HW/gas/high eff. cond. - 1,200 mbh	3 ea	76,326	25,442.00 /ea
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 75%)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 75%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 75%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 75%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 75%) (4-units)	78,000 cfm	1,269,450	16.28 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (classrom)	149 ea	506,657	3,400.38 /ea
Fan coil unit/hydronic 4-pipe/ducted (misc. areas, 1 unit/1,000 sf)	124 ea	553,273	4,461.88 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 6 hp (HW pumps)	2 ea	6,466	3,232.97 /ea
23-01 HVAC	328,000 sf	5,555,713	16.94 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,033,200	3.15 /sf
26-01 ELECTRICAL	328,000 sf	1,033,200	3.15 /sf
78 SECONDARY SCHOOL - Optimized - Gas-Heat	328,000 sf	6,623,353	20.19 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
79 SECONDARY SCHOOL - Optimized - Electric-Heat			
23-01 HVAC			
Hydronic piping connections @ FCU's	273 ea	649,767	2,380.10 /ea
Additional CHW loop	328,000 sf	820,000	2.50 /sf
HW pump/base mount/6 hp	2 ea	10,617	5,308.40 /ea
AC condensate piping distribuiton	328,000 sf	410,000	1.25 /sf
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 75%)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 75%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 75%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 75%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 75%) (4-units)	78,000 cfm	1,269,450	16.28 /cfm
Heat pump heater/chiller/air cooled - 100 ton	3 ea	642,853	214,284.39 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (classrom)	149 ea	506,657	3,400.38 /ea
Fan coil unit/hydronic 4-pipe/ducted (misc. areas, 1 unit/1,000 sf)	124 ea	553,273	4,461.88 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 6 hp (HW pumps)	2 ea	6,466	3,232.97 /ea
23-01 HVAC	328,000 sf	6,122,240	18.67 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,205,400	3.68 /sf
26-01 ELECTRICAL	328,000 sf	1,205,400	3.68 /sf
79 SECONDARY SCHOOL - Optimized - Electric-Heat	328,000 sf	7,327,640	22.34 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
80 SECONDARY SCHOOL - Passive House - Gas-Heat			
22-01 PLUMBING			
Natural gas distribution (3-boilers)	328,000 sf	34,440	0.11 /sf
22-01 PLUMBING	328,000 sf	34,440	0.11 /sf
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	26,500 cfm	212,000	8.00 /cfm
Hydronic piping connections @ FCU's	273 ea	649,767	2,380.10 /ea
Additional CHW loop	328,000 sf	820,000	2.50 /sf
HW pump/base mount/6 hp	2 ea	10,617	5,308.40 /ea
AC condensate piping distribuiton	328,000 sf	410,000	1.25 /sf
Boiler/HW/gas/high eff. cond. - 1,100 mbh	3 ea	71,376	23,792.00 /ea
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 80%)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 80%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 80%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 80%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 80%) (3-units)	78,000 cfm	1,269,450	16.28 /cfm
Fan coil unit/hydronic 4-pipe/horiz. or vert. (classrom)	149 ea	506,657	3,400.38 /ea
Fan coil unit/hydronic 4-pipe/ducted (misc. areas, 1 unit/1,000 sf)	124 ea	553,273	4,461.88 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 6 hp (HW pumps)	2 ea	6,466	3,232.97 /ea
23-01 HVAC	328,000 sf	5,762,763	17.57 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,033,200	3.15 /sf
26-01 ELECTRICAL	328,000 sf	1,033,200	3.15 /sf
80 SECONDARY SCHOOL - Passive House - Gas-Heat	328,000 sf	6,830,403	20.82 /sf



Description	Takeoff Quantity	Total Amount	Total Cost/Unit
81 SECONDARY SCHOOL - Passive House - Electric-Heat			
23-01 HVAC			
Aeroseal - ductwork (based on 1cfm/sf & 10% duct leakage)	26,500 cfm	212,000	8.00 /cfm
Hydronic piping connections @ FCU's	273 ea	649,767	2,380.10 /ea
Additional CHW loop	328,000 sf	820,000	2.50 /sf
HW pump/base mount/6 hp	2 ea	10,617	5,308.40 /ea
AC condensate piping distribuiton	328,000 sf	410,000	1.25 /sf
Chiller/water cooled/centrifugal - 300 tons	2 ea	358,210	179,105.00 /ea
Cooling tower/forced draft/centrifugal/galvanized - 750 ton	1 ea	163,097	163,097.25 /ea
AHU-cafeteria (PSZ/hw&cw coil/economizer/ER 80%)	9,000 cfm	137,025	15.23 /cfm
AHU-gym (PSZ/hw&cw coil/economizer/ER 80%)	14,000 cfm	213,150	15.23 /cfm
AHU-aux gym (PSZ/hw&cw coil/economizer/ER 80%)	11,000 cfm	167,475	15.23 /cfm
AHU-kitchen (PSZ/hw&cw coil/economizer)	3,000 cfm	31,500	10.50 /cfm
AHU-audi (PSZ/hw&cw coil/economizer/ER 80%)	12,000 cfm	182,700	15.23 /cfm
AHU-pod 1 (DOAS/hw&cw coil/economizer/ER 80%) (4-units)	78,000 cfm	1,269,450	16.28 /cfm
Heat pump heater/chiller/air cooled - 92 ton	3 ea	589,459	196,486.39 /ea
Fan coil unit/hydronic 4-pipe/horiz. or vert. (classroom)	149 ea	506,657	3,400.38 /ea
Fan coil unit/hydronic 4-pipe/ducted (misc. areas, 1 unit/1,000 sf)	124 ea	553,273	4,461.88 /ea
VFD w/keypad/disconnect/bypass/NEMA 1 - 6 hp (HW pumps)	2 ea	6,466	3,232.97 /ea
23-01 HVAC	328,000 sf	6,280,846	19.15 /sf
26-01 ELECTRICAL			
Mechanical power & connection	328,000 sf	1,205,400	3.68 /sf
26-01 ELECTRICAL	328,000 sf	1,205,400	3.68 /sf
81 SECONDARY SCHOOL - Passive House - Electric-Heat	328,000 sf	7,486,246	22.82 /sf