C. Gerald Lucey Building  226 Main Street Brockton MA

Addressing Material Tolerances at the Timber to Steel Spine

Department of Unemployment Assistance
Massasoit Community College

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board
DESIGN AND CONSTRUCTION TEAM

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Jonathan Rossini  Project Manager  BOND Building Construction

OWNER  Division of Capital Asset Management and Maintenance

ARCHITECT  Jones Architecture

STRUCTURAL ENGINEER  RSE Associates

CONSTRUCTION MANAGER  Bond Building Construction

TIMBER SUPPLIER/INSTALLER  South County Post and Beam

CIVIL ENGINEER  Samiotes Consultants, Inc.

LANDSCAPE ARCHITECT  Crowley Cottrell Landscape Architecture, LCC

HVAC, FP, PLUMBING ENGINEER  BVH Integrated Services

ELECTRICAL, FA, TELECOM ENGINEER  ART Engineering Corporation

BUILDING CODE  Code Red Consultants

COST ESTIMATION  Ellana, Inc.

SUSTAINABLE DESIGN  The Green Engineer

LIGHTING DESIGN  Available Light

HAZMAT CONSULTANT  ATC Environmental, LLC
Agenda

01 Why Hybrid?
02 Design, Procurement & Coordination
03 In the Field
04 Lessons Learned
Why Hybrid?

A. Cost
B. Code
C. Program
D. Distribution of Services
WHY HYBRID? - Cost

MANAGING VALUE

1. Client was focused on using CLT, however, budget constraints remained.

2. Design team explored full CLT for an add of $225K.

3. $80K savings to go to all steel frame, as opposed to a Glulam Frame. This was not adopted as the value of wood to the client was much greater than this number.
WHY HYBRID - Code

LATERAL BRACING

1. The building code at the time of design did not allow for lateral bracing using timber.

2. The project timeline would not allow pursuing a variance for Glulam bracing.

3. This may not be an issue in future code adaptations.
WHY HYBRID? - Program as a Factor for CLT
Department of Unemployment Assistance - Call Center

Drawing Key
- Administration
- Hearings
- Claims
- Shared
- Adjudication
- Flexible
WHY HYBRID? - Program as a Factor for CLT
Flexible Office Space with Center Spine
WHY HYBRID? - Distribution of Services
Steel Spine - Level 3 Plan, Views
WHY HYBRID - Distribution of Services
Steel Spine - Building Section, Level 1 Views

1. Work Area
2. Reception
3. Elevator Lobby
4. Corridor
5. Mechanical Room
6. Supervisor Office
7. Seasonal Call Center
8. Call Center West
9. Corridor
10. Call Center East
A. Early Bid Package(s)
B. Procurement & Team Structure
C. Coordination Reviews
D. Material Tolerances
WOOD TO WOOD CONNECTIONS
The design intent was to hide all wood to wood connections to express highlight the timber as much as possible.

WOOD TO STEEL COLUMN CONNECTION
Some preliminary steel connections were carried in the early timber package, but needed more design once proprietary info became available. NOTE steel deck was eventually used in the core, not CLT.
STEEL LEDGERS TO SUPPORT CLT
The steel package included detail on the steel ledgers, plates, bolts, etc. needed to hold CLT slabs at the CMU walls, steel beams, and elsewhere.

WOOD TO STEEL COLUMN CONNECTIONS
This detail was developed further, however the final steel connection at the wood beam was not yet determined.
**DESIGN, PROCUREMENT, & COORDINATION - Team Structure**

**Many Players**

- **ARCHITECT** → **STRUCTURAL ENGINEER**
- **DESIGN TEAM**
- **CONSTRUCTION MANAGER**
  - **TIMBER SUBCONTRACTOR**
    - **PROCUREMENT**
    - **INSTALLATION**
  - **STEEL SUBCONTRACTOR**
    - **FABRICATION & INSTALLATION**
DESIGN, PROCUREMENT, & COORDINATION - Team Structure

Many Players

**DESIGN TEAM**
- ARCHITECT
- STRUCTURAL ENGINEER

**CONSTRUCTION MANAGER**
- TIMBER SUBCONTRACTOR
- STEEL SUBCONTRACTOR

**PROCUREMENT**
- GLULAM (BEAMS & COLUMNS)
- CLT (DECK)

**INSTALLATION**
- SITE SUPER (TIMBER SUB)

**FABRICATION & INSTALL**
- SPECIALTY INSTALLERS (SUB-SUB)
DESIGN, PROCUREMENT, & COORDINATION - Coordination Reviews

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This page contains coordination reviews for Wood Shop Drawings.

1. This drawing is the property of KLH USA Holding. Copyright is reserved & this drawing is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person, either wholly or in part, without our consent. Do not scale from this drawing, check all dimensions on site. If in doubt, please ask.

2. All dimensions are shown both in millimeters [inches] unless noted otherwise. The grades of finish are as follows: NSI (non-visual quality); ISI (visible industrial quality); WSI (domestic quality).

3. Where not specified, the grade finish would be NSI.

4. The finish to the side facing down is shown with parentheses and the top face is shown without.

5. HH = Head Height; CH = Cill Height; H = Height. All Heights refer to Structural Slab Level (SSL).

6. All openings and notches have routed corners (standard radius = 20mm), unless noted or instructed otherwise. Square corners to openings and notches less than 500mm wide will have to be cut on site by the installation team.


8. Installation of KLH super structure to be strictly in accordance with project related OSHA requirements. Please refer to installer for this information.

9. Material Order Approved
   Submit Specified Items
   Approved With Comments Field Notes Required
   No Exception Taken
   Not Reviewed
   Revise and Resubmit Rejected

10. CLT-101
     Location Plan
     Structure for reference. Refer to structural drawings for final requirements

11. GLULAM COLUMN BASE
     Per 1/CLT-002

12. CLT Panel Assembly Isometric
     Scale: 1

13. 5" DRILLING

14. 8" CMU WALLS, BY OTHERS

15. STRUCTURAL STEEL, SHOWN FOR REFERENCE. REFER TO STRUCTURAL DRAWINGS FOR FINAL REQUIREMENTS

16. 240 N Broadway
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    Portland, OR 97212
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17. DRAWING NOTES:
    WET STAMP & DATE:
    PROJECT
    DRAWING TITLE
    DRAWING NO.
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DESIGN, PROCUREMENT, & COORDINATION - Coordination Reviews

Wood Shop Drawings

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6. All openings and notches have routed corners (standard radius = 20mm), unless noted or instructed otherwise. Square corners to openings and notches less than 500mm wide will have to be cut on site by installation team.

7. X: Elevation title      Y: Section title

8. Installation of KLH super structure to be strictly in accordance with project related OSHA requirements. Please refer to installer for this information.

QUALITY ASSURANCE:

· STORE PANELS IN CONDITIONED AND HUMIDITY CONTROLLED ENVIRONMENT.

· IF PANELS ARE EXPECTED TO HAVE PROLONGED EXPOSURE TO MOISTURE, KLH RECOMMENDS END-GRAIN SEALER APPLIED TO PANEL EDGES TO MINIMIZE MOISTURE ABSORPTION AND PREVENT VISIBLE CAPILLARY ACTION IN WOOD END GRAIN.

· ALL STEEL COMPONENTS PROVIDED BY KLH TO HAVE PRIMER.

· DO NOT CUT OR WELD STEEL NEAR PANELS WITHOUT FIRST PROTECTING FROM FERROUS STAINING.

· APPLY MOISTURE (AND INSECT WHERE APPROPRIATE) BARRIER BETWEEN PANEL EDGE AND SILL PLATE.

· SHIM UNDER SILL ELEMENT FOR UNIFORM LEVEL OF SCOPE. DO NOT SHIM DIRECTLY UNDER PANEL.

· REMOVE EXCESS WATER AND MINIMIZE EXPOSURE TIME FOR BEST RESULTS.

PROJECT NOTES:

· VERIFY DETAILS FIT FIELD CONDITIONS AND OTHER CONSTRUCTION SYSTEMS.

· ALL CONNECTIONS ARE APPROXIMATE, AND TO BE REVIEWED AND APPROVED BY STRUCTURAL ENGINEER.

· ALL CONNECTIONS INCLUDED HAVE BEEN APPROVED PER INCLUDED STAMP.

· SPRUCE SPLINE BOARD MATERIAL TO BE PROVIDED BY KLH.

· FASTENERS TO BE PROVIDED BY KLH.

· STEEL ASSEMBLIES FOR GLULAM INSTALL TO BE PROVIDED BY KLH.

· STRUCTURAL STEEL TO BE PROVIDED BY OTHERS.

SCALE: 3"=1'-0"
DESIGN, PROCUREMENT, & COORDINATION - Coordination Reviews

Wood Shop Drawings

Plan Detail - 260 Width

Plan Detail - 220 Width

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DESIGN, PROCUREMENT, & COORDINATION - Material Tolerances

The "Core" Difference

Per spec 061880 Glued-Laminated Construction:
All glue-laminated wood shall be fabricated in conformance with ANSI/AITC A190.1-1983 Structural Glued Laminated Timber, and AITC 117.84 - Design and Manufacturing for structural glue laminated timber of softwood species.

Per ANSI 190.14.1 length - Plus or minus 1/16" per foot

Per spec 051200 Structural Steel Framing:
Conform to AISC's Code of Standard Practice for Steel Buildings and Bridges.

Per ASTM A6 mill tolerances are - Typically 1/8" per foot

Over the height of the building, 41'-5" that could account for 2.5" of discrepancy between the materials.
In the Field

A. Sequence of Operations
B. Identifying the Locations
C. Adjustments Made
IN THE FIELD - Sequence of Operations

October 2020

December 2020

January 2021

April 2021
3 CEILING DETAIL AT EGRESS CORRIDOR
6 DETAIL @ 3RD FLR OFFICE, TYP.

TO PLANS FOR WALL TYPE

STRUCTURAL DECK, SEE
PTD HM AND WINDOW
ROOF ASSEMBLY,
ACT, HUNG FROM
EXPOSED CROSS

PTD GWB TYP
7 3/8"
0'-7"
HSS
6X6
6" ABOVE FINISHED CEILING
LIGHT FIXTURE, REFER TO
(2) LAYERS OF 5/8" GWB
3 5/8" LGMF
6" ALUM. CURTAINWALL MULLION,
ACOUSTIC MAT, TURNED UP
METAL TRANSITION STRIP
T.O.S. ROOF
FLOOR CLOSURE PIECE
LOW PROFILE ACCESS
LOW PROFILE ACCESS
7/8" FURRING (GALV)
159' - 2"
CLT STRUCTURE
LINOLEUM TILE

2 TRANSITION DTL @ RAISED FLR, TYP
IN PLAN
SCALE: 3" = 1'-0" A420

PAD
PTD GWB
DUCT, REFER TO MEP DWGS
CONCRETE TOPPING SLAB
F REVEAL AT EXPOSED
FLOOR WHERE NOTED
STRUCTURAL DWGS
CORNER BEAD, TYP.
CLT/GLU-LAM

SEE WALL TYPES
WALL BASE PER
SCHEDULE
CHANNEL

145' - 10" LEVEL 3
STEEL STRUCTURE
STEEL DECKING, REFER TO
STEEL PLATE, REFER TO

2 1/2" LGMF
5/8" GWB
SEAL ALL EDGES TO REDUCE
SOUND TRANSFER UNDER
MANUFACTURER

DETAIL @ CORE SOFFIT, TYP
2"
6"

ACOUSTIC MAT, TURNED UP
CONCRETE TOPPING SLAB

LEVEL 2
LIGHT FIXTURE, SEE ELEC
132' - 6"

FLOORING SLAB. REFER TO
2 1/2" LGMF
5/8" GWB
SEAL ALL EDGES TO REDUCE
SOUND TRANSFER UNDER
MANUFACTURER

1 DETAIL @ STEPPED SLAB
SCALE: 1 1/2" = 1'-0" A420
PTD GWB
LEVEL 2
LIGHT FIXTURE, SEE ELEC
132' - 6"

STEEL PLATE, REFER TO

2 1/2" LGMF
5/8" GWB
SEAL ALL EDGES TO REDUCE
SOUND TRANSFER UNDER
MANUFACTURER

1 DETAIL @ STEPPED SLAB
SCALE: 1 1/2" = 1'-0" A420
PTD GWB
LEVEL 2
LIGHT FIXTURE, SEE ELEC
132' - 6"

STEEL PLATE, REFER TO

2 1/2" LGMF
5/8" GWB
SEAL ALL EDGES TO REDUCE
SOUND TRANSFER UNDER
MANUFACTURER

IN THE FIELD - Identifying the Locations
Tolerances Between Timber and Steel

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IN THE FIELD - Identifying the Locations
Tolerances Between Timber and Steel
IN THE FIELD - Adjustments Made
Tolerances Between Timber and Steel
IN THE FIELD - Adjustments Made

Tolerances Between Timber and Steel
IN THE FIELD - Adjustments Made
Tolerances Between Timber and Steel
IN THE FIELD - Adjustments Made
Tolerances Between Timber and Steel
Lessons Learned

A. Building in Tolerance
B. Working with a Larger Team
LESSONS LEARNED - Building in Tolerance
Tolerances Between Timber and Steel
LESSONS LEARNED - Working with a Larger Team

Many Players
LESSONS LEARNED - Working with a Larger Team

Many Players
Thank you!
The End.

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