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ENGINEERING EVALUATION OF BUILDING ROOF-SUPPORT CAPACITY FOR ROOFTOP HVAC UNIT

at

Raintree Village Shopping Center
865 Lemans Lane
Lee's Summit, MO 64082

Prepared for:

Mr. John C. Smith, Operating Partner
Papa John's

Prepared by:

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May 9th, 2018
File No.: 0118076

SUMMARY REPORT

Introduction:

This report provides an engineering evaluation of the building roof-support capacity of the Raintree Village Shopping Center, above the new Papa John's store, located at 865 Lemans Lane in Lee's Summit, Missouri. The purpose of this evaluation was to determine the requirements for the installation of a new 5-ton capacity RTU (Rooftop Unit) on the roof above the tenant space. The services provided regarding this matter consisted of the following:

- Site examination of the roof support structure at the location for the new RTU
- Review of Structural Framing Plans for the building
- Analysis of the loading impact of a new 5-ton RTU (weight less than 1100 lbs) on the existing roof-framing components.

Condition Assessment:

On April 24, 2018, Carl E. Martin, P.E., of Engineering Perspective, traveled to the Raintree Village Shopping Center at 865 Lemans Lane in Lee's Summit, Missouri to examine the roof framing conditions that existed. During the examination photographs were taken to document the conditions found, and these photographs have been included in Appendix A of this report.

Observations made and information collected during the examination of the roof framing conditions at the Raintree Village Shopping Center and the Papa John's store location within the shopping center are summarized as follows:

1. The Raintree Village Shopping Center was found to consist of a masonry and steel structure. A site aerial view of the shopping center has been included in Appendix A of this report indicating the area of review for the Papa John's store and the associated RTU (rooftop unit) addition on the roof. The front elevation of the building was considered to face north for purposes of this evaluation. The Papa John's store was located at the first space east of the central main area of the building (Photograph 1).

2. The interior area of the Papa John's tenant space was accessed from the front door. An existing RTU was located at the rear of the store and found to have a 4x4x1/4 angle frame spanning between the bar joists that were located at 5-foot centers and supporting the RTU, along with additional internal 4x4x1/4 angle framing forming a box-frame support configuration (Photographs 2, 3 & 5) and located approximately 10'-2" from the rear wall. A main steel support beam was found located at the center of the beam oriented in the east-west direction providing support to the north/south-oriented bar joists that supported a conventional metal deck.

3. On the north side of the main steel east/west-oriented support beam, no other framing or substantial additional building loads on the roof joists were found to exist (Photographs 4 & 8). The bar joist span on the north side of the support beam was measured to be 34 feet.

4. The tenant space information for the Papa John's store (Photograph 7) was found to consist of the following:

    - 2,885 S.F., Fully Sprinkled
    - Occupancy Group: Mercantile M
    - Type of Construction: V-B

5. The location of the new RTU, of similar size and capacity as the existing southside unit, was identified to be within 10 feet of the existing main east/west-running steel support beam (Photograph 9). The tenant space was measured to be approximately 18'7"x 65'.

Review of the original construction drawings for the Raintree Village Shopping Center was completed and indicated the following:

6. The Raintree Village Shopping Center was constructed in 2005, based on the 2003 IBC. The roof structure design was based on a 20-psf live load, and included provisions for snow exposure and drifting. The main east/west support beam in the Papa John's store was found to consist of a W24x62, spanning from interior 6x6x1/4" HSS columns a distance of 36'-6"+/-. The bar joists on the south side of the main support beam consisted of 20KSP1 at 5-foot centers, and 20SKP2 bar joists were to have been installed, based on the drawings, at mechanical units. At the north side of the interior steel support beam, the bar joists were designated as 20KSP3 and located at 5-foot centers. The roof deck consisted of 1-1/2"-type B wide rib, 22-gage painted deck with 3/8"-diameter puddle welds to the joists, on a 36/7 weld pattern, span condition requirement.

7. The bar joist designation 20KSP1 and 20KSP2 were designed as 20K6 joists. The bar joist designation 20KSP3 and 20KSP4 were also designed as 20K6 joists (minimum). The design dead load was 100 plf, and the design live load was also 100 plf. The bar joist span on the north side of the steel support beam was indicated to be 34 feet.

Evaluation:

Examination of the location where the new RTU installation was planned indicated that the RTU would be located no more than 10 feet north of the main support beam. The existing design data for the bar joist indicated that the joists were designed for a 20 psf live load and dead load. A dead load of 10 psf is generally considered adequate; therefore, some additional safety factor regarding load capacity of the bar joists exists with regard to the actual bar joist selection which was designed to be 20K6. The minimum joist selection of 20K6 provides for a design live-load capacity of 137 plf, and a total load capacity of 246 plf based on specification data from the Steel Joist Institute. The existing bar-joist capacity was analyzed with regard to bending stress capacity and then the impact of the added point loads for the new RTU was added, which indicated that, based on the original design load criteria and an RTU weight of less than 1100 lbs, the bending stress and load capacity of the existing bar joists would not be exceeded. These calculations have been summarized in Appendix B of this report.

Generally for compliance with the City of Lee's Summit, drawings of the RTU support framing that are coordinated with the capacity analysis are necessary, including a special inspection report after installation. Therefore, attached in Appendix C of this report are drawings depicting the general installation requirements of the new proposed RTU and associated support framing.

Conclusions:

Based on the results of the site examination, review of applicable documents associated with the Raintree Village Shopping Center tenant space identified as 865 Lemans Lane in Lee's Summit, Missouri and the applicable analysis of the information, it is the opinion of ENGINEERING PERSPECTIVE that:

1. The existing roof bar joists at the location identified on the drawings and depicted on the associated documents have the capacity to support one (1) additional RTU unit based on the data included in this analysis.

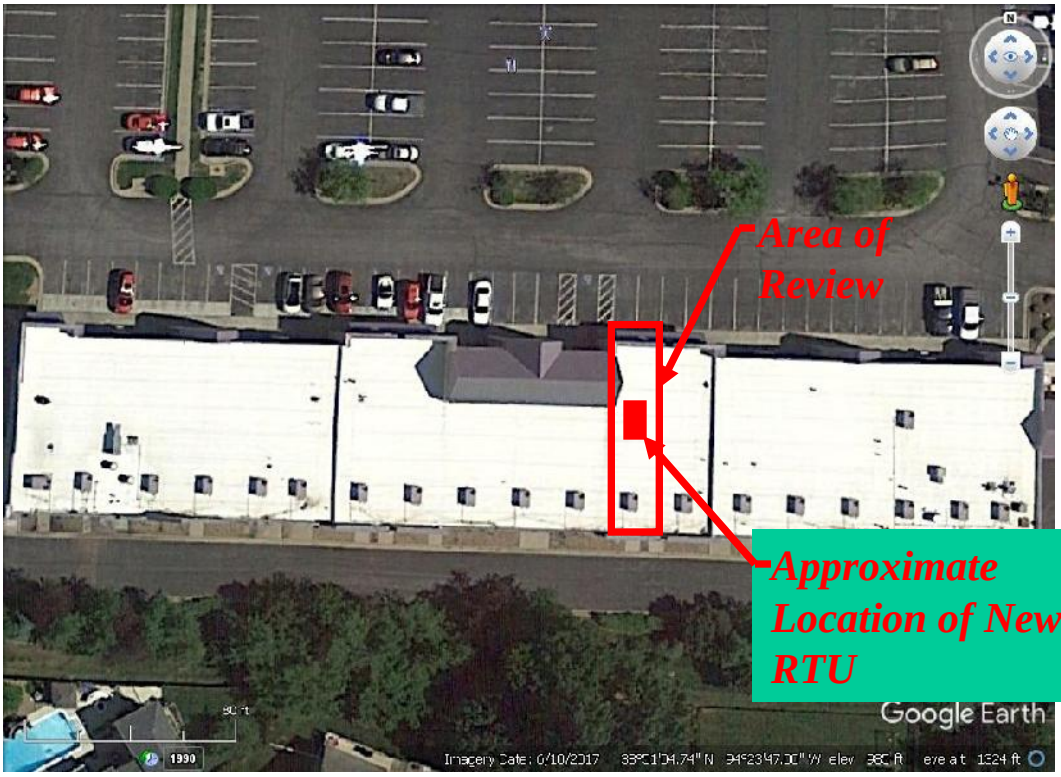
2. The new RTU should be supported in a manner similar to the existing RTU units that exist at the facility and as indicated on the drawings provided in Appendix C of this report.

APPENDIX A

Site Photographs (04/24/2018)

Appendix A – 04/24/2018

Site Aerial View – 06/10/2017



Building Aerial View – 06/10/2017

Appendix A – 04/24/2018

1

2

Appendix A – 04/24/2018

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4

Appendix A – 04/24/2018

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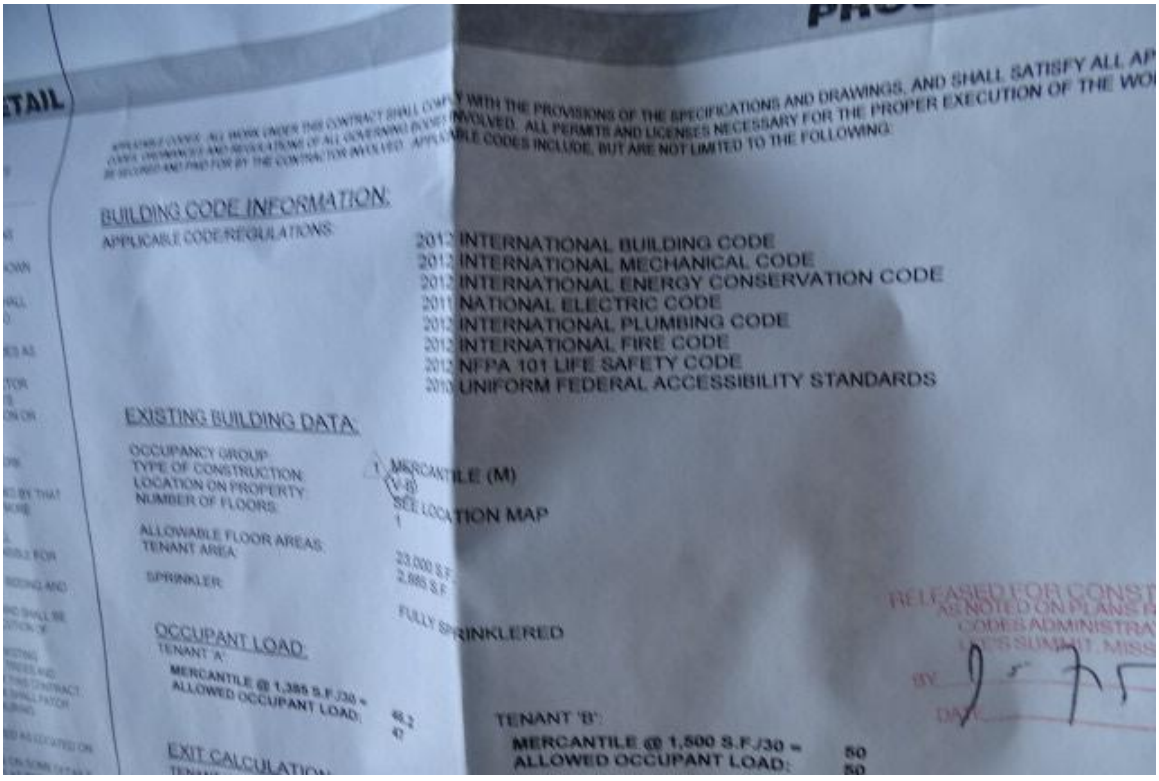

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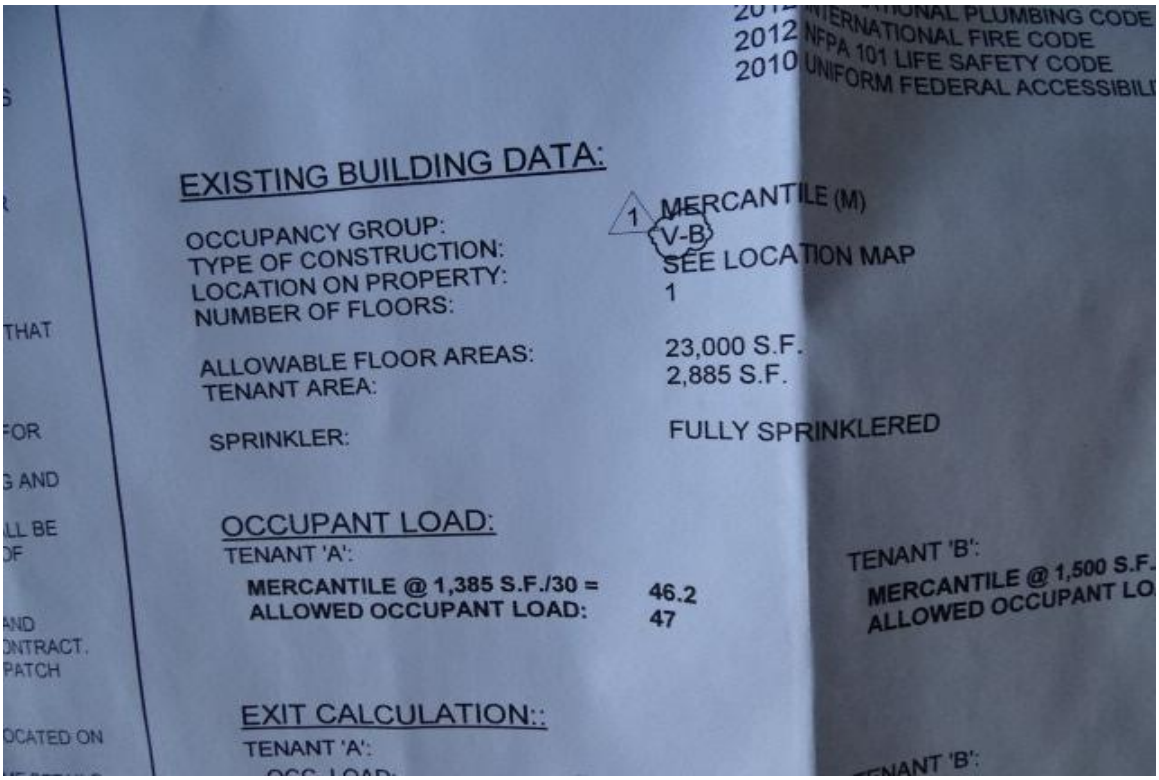
Appendix A – 04/24/2018



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Appendix A – 04/24/2018

9

APPENDIX B

Analysis of Existing Bar Joist Loading Capacity

APPENDIX B

STRUCTURAL CALCULATIONS FOR RTU UNIT ADDITION TO ROOF BAR JOISTS

at 865 S.W. Lemans Lane, Lees Summit, Missouri

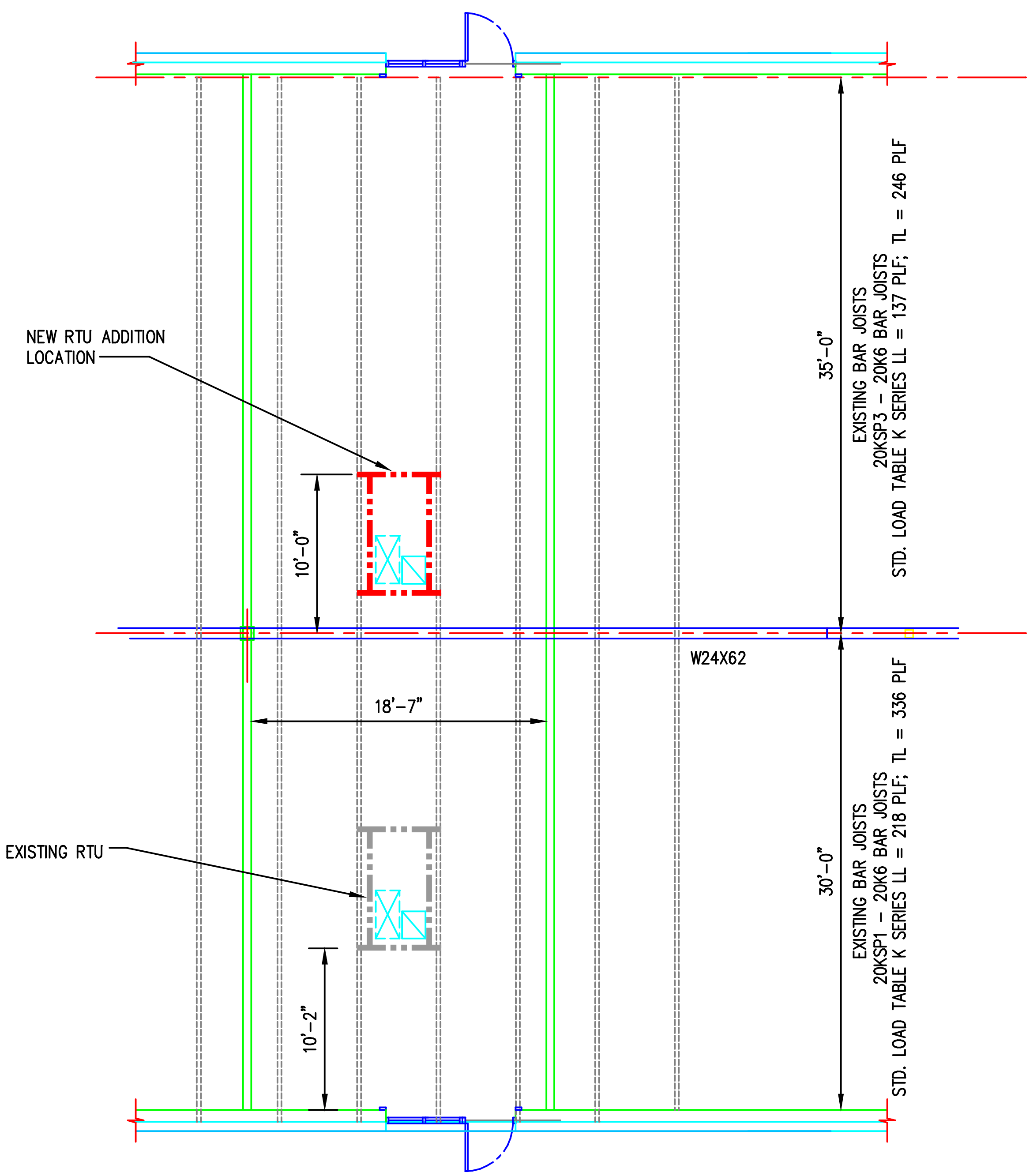
Bar Joist Spacing = 5 feet on Center

Building Design Loads LL = 20 psf
DL = 20 psf

RTU #	RTU Location in Span a (ft)	b (ft)	Weight (lbs)	Load/Joist (lbs)	Bar Joist	Joist Design Capacity TL (plf)	LL (plf)	Bar Joist Span (ft)	Joist Allowable Capacity Moment Capacity(lb-ft)	Building Loads Design Moment (lb-ft)	RTU Load Design Moment (lb-ft)	New Total Moment on Joist Bldg + RTU (lb-ft)	New Total Design Moment is Less Than Allowable	Excess Moment Capcity (lb-ft)	(%)
1	4	25	1100	550	20K6	246	137	35	37,669	30,625	5,500	36,125	YES-OKAY	1544	4.1%

Appendix C

Framing Plans for New RTU Support



PARTIAL PLAN - EXISTING ROOF FRAMING AND RTU LOCATIONS

AERIAL VIEW PARTIAL PLAN
EXISTING AND NEW RTU LOCATIONS

MARK	NOM. TONS	MFG.	WEIGHT
NEW RTU	5.0	YORK/CARRIER	1100 LBS MAX

APPLICABLE BUILDING CODES:

2012 INTERNATIONAL BUILDING CODE

GENERAL CONSTRUCTION NOTES:

1. ALL WORK ON THIS PROJECT SHALL BE IN COMPLIANCE WITH THE LATEST EDITION OF ALL APPLICABLE BUILDING CODES.
2. THE CONTRACTOR SHALL APPLY, PAY FOR, AND OBTAIN ALL PERMITS AND OR ANY INSPECTIONS REQUIRED BY REGULATORY AUTHORITIES.
3. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITION OF PREMISES ON WHICH THE WORK IS PERFORMED AND FOR THE SAFETY OF ALL PERSONS AND PROPERTY ON THE SITE DURING PERFORMANCE OF THE CONTRACT.
4. CONTRACTOR MUST INSPECT ALL EXISTING CONDITIONS BEFORE COMMENCING WORK, AND COLLECT ALL NECESSARY FIELD CONDITION INFORMATION NECESSARY TO COMPLETE THE WORK DESCRIBED.
5. CONTRACTOR TO PROVIDE TEMPORARY SHORING OF ANY WALLS.
6. ALL DIMENSIONS MUST BE FIELD VERIFIED AND AS SHOWN ARE APPROXIMATE.
7. SUPPLIER SUBMITTAL REQUIRED IN ACCORDANCE WITH CITY BUILDING CODE REQUIREMENTS.
8. NOTE TO ALL CONTRACTORS: WHERE THE WORK IS SHOWN ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS EXCEEDS THE REQUIREMENTS OF THE ABOVE LISTED CODES, THE WORK SHALL CONFORM TO THE DRAWINGS AND/OR SPECIFICATIONS, AND CONFORMANCE TO THE MINIMUM STANDARDS ESTABLISHED BY THE CODE SHALL NOT BE ACCEPTABLE.

STRUCTURAL STEEL:

1. GENERAL - SECTION REQUIREMENTS:
   - 1.1.1. SUBMITTALS - NONE REQUIRED
   - 1.1.2. DESIGN, "RCSC's" SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A 325 OR A 490 BOLTS," AND AWS D1.1 "STRUCTURAL WELDING CODE -- STEEL."
2. PRODUCTS:
   - 2.1. STRUCTURAL STEEL AND ACCESSORIES
     - 2.1.1. STRUCTURAL STEEL WIDE-FLANGE BEAMS: ASTM A992
     - 2.1.2. STRUCTURAL STEEL SHAPES, PLATES, AND BARS: ASTM A 36 (ASTM A36M), CARBON STEEL
     - 2.1.3. ANCHOR RODS, BOLTS, NUTS: ASTM A 325
     - 2.1.4. BOLTS, NUTS, AND WASHERS: ASTM A 325, TYPE 1, HIGH STRENGTH HEAVY HEX CARBON-STEEL, STRUCTURAL BOLTS, HEAVY HEX CARBON-STEEL NUTS, AND HARDENED CARBON-STEEL WASHERS, UNCOATED.
   - 2.2. FABRICATION:
     - 2.2.1. FABRICATE STRUCTURAL STEEL ACCORDING TO AISC SPECIFICATIONS AND TOLERANCE LIMITS OF AISC's "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" FOR STRUCTURAL STEEL.
3. EXECUTION ERECTION:
   - 3.1. ERECT STRUCTURAL STEEL ACCORDING TO AISC SPECIFICATIONS AND WITHIN ERECTION TOLERANCES OF AISC's "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES."
   - 3.2. SET BASE AND BEARING PLATES ON WEDGES, SHIMS, OR SETTING NUTS. TIGHTEN ANCHOR BOLTS, CUT OFF WEDGES OR SHIMS FLUSH WITH EDGE OF PLATE.
   - 3.3. BOLTED CONNECTIONS: INSTALL AND TIGHTEN NON HIGH-STRENGTH BOLTS, UNLESS HIGH-STRENGTH BOLTS ARE INDICATED. SNUG TIGHTEN HIGH-STRENGTH BOLTS ACCORDING TO RCSC's "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A 325 OR A 490 BOLTS."
   - 3.4. WELD CONNECTIONS: COMPLY WITH AWS D1.1.

METAL FABRICATIONS:

1. GENERAL - SEE STRUCTURAL STEEL REQUIREMENTS:
2. PRODUCTS - METALS:
   - 2.1. STRUCTURAL STEEL WIDE-FLANGE BEAMS: ASTM A992
   - 2.2. STEEL PLATES, SHAPES, AND BARS: ASTM A 36 (ASTM A36M)
3. EXECUTION - INSTALLATION:
   - 3.1. PERFORM CUTTING, DRILLING, AND FITTING REQUIRED FOR INSTALLING MISCELLANEOUS METAL FABRICATIONS.
   - 3.2. FIT EXPOSED CONNECTIONS ACCURATELY TOGETHER TO FORM HAIRLINE JOINTS.

SCOPE OF WORK NOTES:

1. CONTRACTOR TO VERIFY EXISTING RTU SUPPORT FRAMING
2. CONTRACTOR TO ENCHANCE EXISTING FRAMING AS SHOWN ON DRAWINGS FOR R.T.U. UNIT SUPPORT. VERIFY ALIGNMENT UNDER CURB AS SHOWN ON DRAWINGS
3. CONTRACTOR SHALL REPAIR/PATCH EXISTING ROOF SIMILAR TO ORIGINAL FOR WEATHER-TIGHT FINISH. VERIFY WATER-TIGHT SEAL AFTER WORK.

REV.	DATE	DESCRIPTION	CK. BY
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SHEET TITLE
PARTIAL BUILDING ROOF FRAMING PLAN

PROJECT TITLE
RTU LOAD ANALYSIS
PAPA JOHN'S STORE
865 SW LEMANS LANE
LEES SUMMIT, MISSOURI

CLIENT
PAPA JOHN'S

ENGINEERING PERSPECTIVE INC.
2601 N. HUB DRIVE, INDEPENDENCE, MISSOURI
PH [illegible], FAX [illegible]

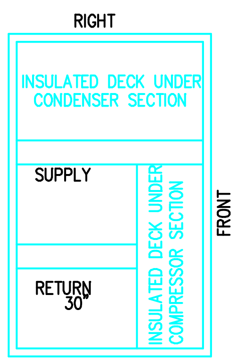
PROJ. NO. 0118076	DWN. BY: CEM	Q/A RVW BY: CEM
DSN. BY: CEM	CHK. BY: CEM	APP. BY: CEM

CADD FILE: S1

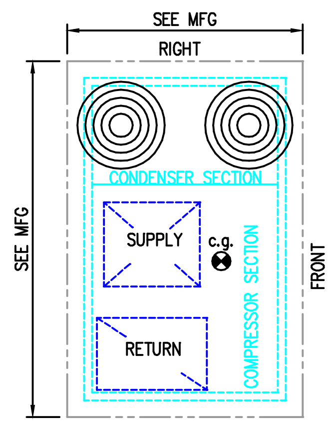
DATE: 05/10/2018

SCALE: 3/16" = 1'-0"

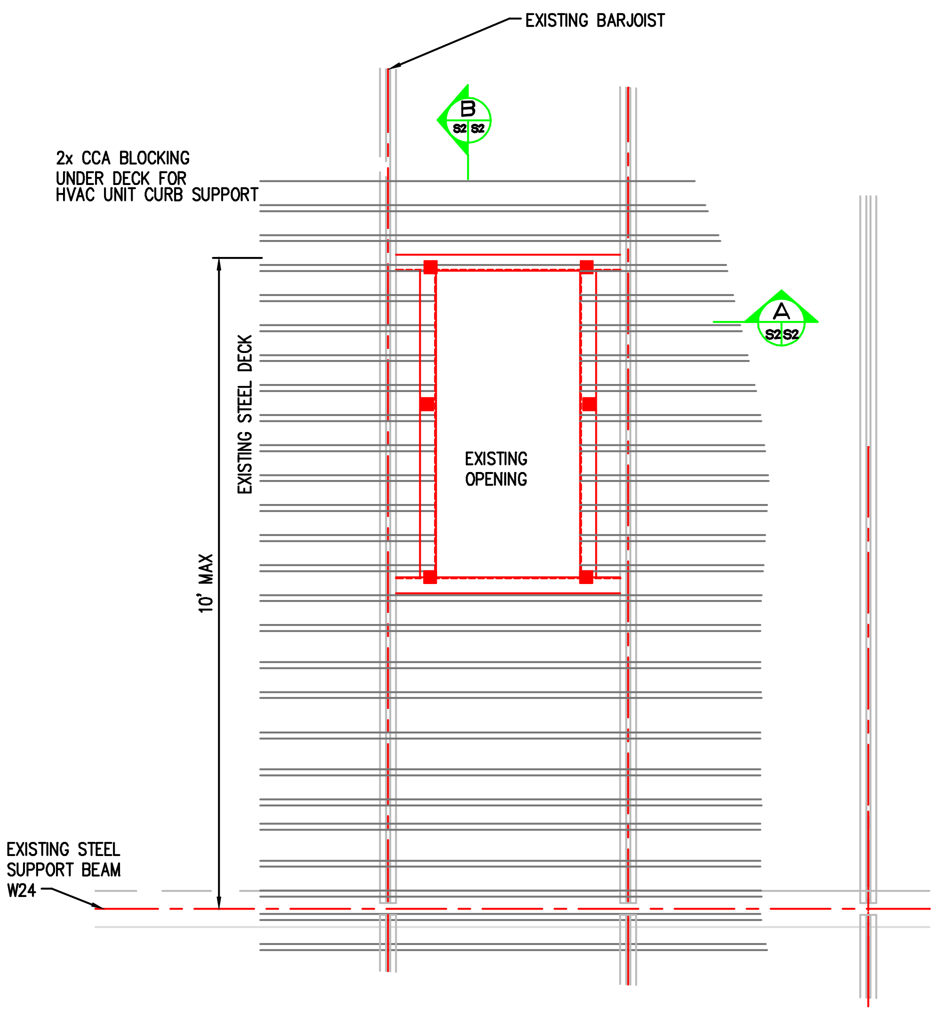
DRAWING NO.



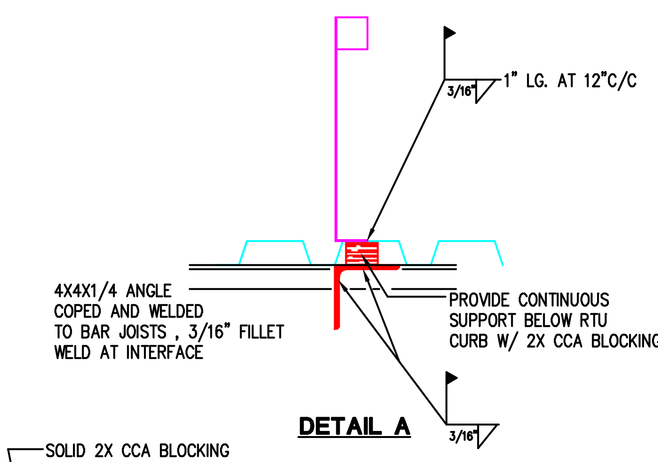
NEW RTU CURB



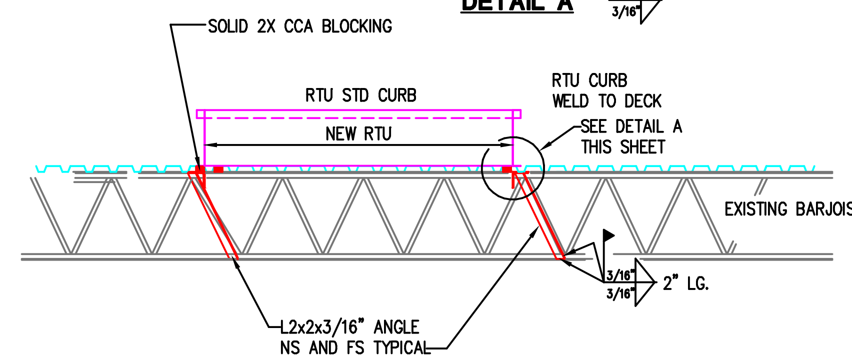
NEW RTU ASSY PLAN



RTU FRAMING PLAN



DETAIL A



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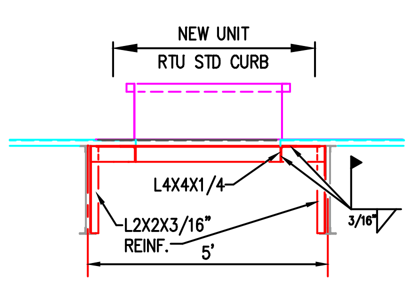

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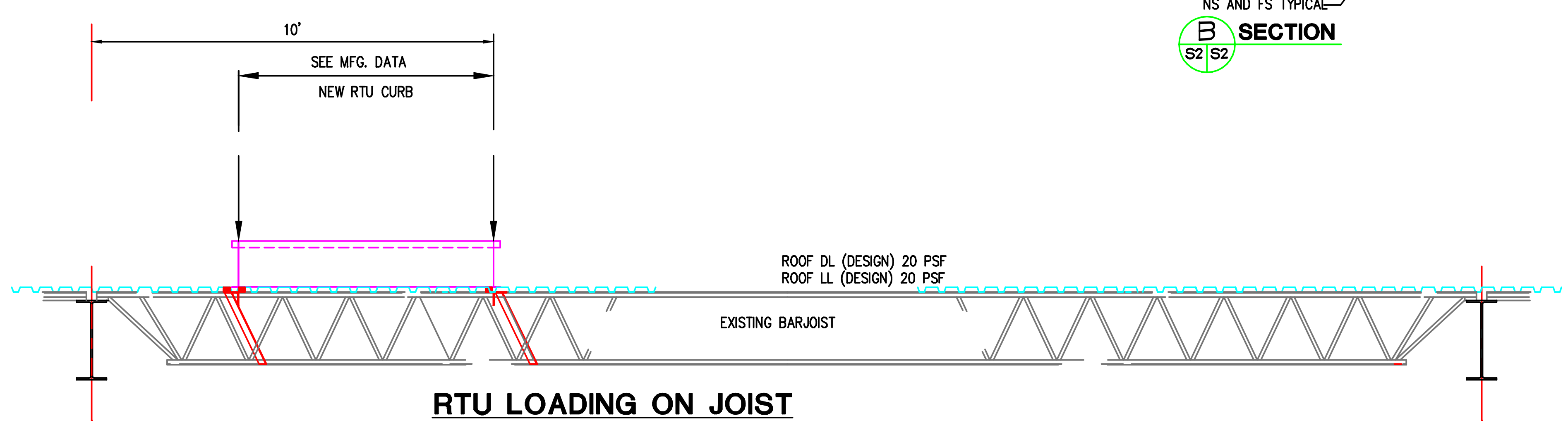

RTU LOADING ON JOIST

SCALED FOR 24X36 SHEETS, FOR 12X18 SHEETS DOUBLE SCALE SHOWN

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: RTU FRAMING PLANS SECTIONS AND DETAILS

PROJECT TITLE: RTU LOAD ANALYSIS PAPA JOHN'S STORE 865 SW LEMANS LANE LEES SUMMIT, MISSOURI

CLIENT: PAPA JOHN'S

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PROJ. NO. 0118076
DWN. BY: CEM
Q/A RVW BY: CEM
DSN. BY: CEM
CHK. BY: CEM
APP. BY: CEM

CADD FILE: CEM
DATE: 05/10/2018
SCALE: 1/2"=1FT.
DRAWING NO.
S2 of 2