



Planning & Zoning Commission

August 26, 2020 at 7:00 p.m.

Village Hall, 447 N. Catherine Avenue, La Grange Park, IL

Via Teleconference due to Covid-19

Members of the public are encouraged to attend this meeting.

Join this meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/496487709>

You can also dial in using your phone. US: +1 (872) 240-3412 / Access Code: 496-487-709

Public Comments may be submitted prior to and up until 4:30 p.m. the day of the meeting via email: erodman@lagrangepark.org. You may also submit your comments by calling (708) 354-0225, M-F from 9:00 – 4:30 p.m.

Agenda

1. Chairman to Convene Meeting
2. **Chairman Statement: This meeting is being held remotely as a meeting with a quorum of the public body physically present is not practical or prudent due to the State's declaration of a disaster due to the impacts of COVID-19**
3. **Roll Call - Confirm All Participants Can Hear & Reminder That All Motions Need To Be Passed By A Roll Call Vote**
4. Pledge of Allegiance
5. Public Comment
6. Approval of Minutes – July 20, 2020
7. Public Hearing #2020-02 to Consider an Application for Temporary Use Permit and Zoning Variations for the Property Located at 1117 E. 31st Street, La Grange Park, IL 60526
8. Consideration of Site Plan Review 937 Barnsdale Road [T-Mobile]
9. Review and Approval - Findings of Fact Zoning Case #2020-01 (16 W. Woodlawn Avenue)
10. Adjournment

The Village of La Grange Park is subject to the requirements of the Americans with Disabilities Act of 1990. Individuals with disabilities who plan to attend this meeting and who require certain accommodations in order to allow them to observe and/or participate in this meeting, or who have questions regarding the accessibility of the meeting or the facilities, are requested to contact Emily Rodman, Assistant Village Manager, at 708-354-0225 x108 promptly to allow the Village of La Grange Park to make reasonable accommodations for those persons. Website <http://www.lagrangepark.org/>



RULES FOR PUBLIC COMMENT

Village Meetings

1. Please step up to the microphone before speaking, and announce your name before beginning your comments.
2. After announcing your name for the record, you will be allowed to speak for three (3) minutes.
3. You may not use profane or obscene language and you may not threaten any person with bodily harm, or engage in conduct which amounts to a threat of physical harm.
4. (a) Agenda-related comments: The Village Chairperson reserves the right to disallow comments that are repetitive of comments previously made during the meeting, or comments that do not relate to agenda items.

(b) Non-agenda-related comments: The Village Chairperson reserves the right to disallow comments that are repetitive of comments previously made during the meeting, or comments that do not relate to Village business, Village services or Village governance.
5. The Village of La Grange Park complies with the Americans with Disabilities Act of 1990. If you require accommodations in order to observe or participate in the meeting, please contact Ms. Emily Rodman at (708) 354-0225 between 9:00 and 5:00 before the meeting so that the Village can make reasonable accommodations for you.

Planning & Zoning Commission Agenda Memo

Date: August 26, 2020

To: Eric Boyd, Planning & Zoning Commission Chair
Members of the Planning & Zoning Commission

From: Emily Rodman, Assistant Village Manager

RE: 1117 E. 31st Street, Murphy's Transmission & Complete Auto Repair - ZONING VARIATION, SPECIAL USE PERMIT, SITE PLAN REVIEW REQUEST [#2020 - 02]

GENERAL BACKGROUND

The subject property is located at 1117 E. 31st Street. The property is a corner lot and fronts 31st Street to the south and Kemman Avenue to the East. A public alley is located to the rear of the property on the north side. Ingress and egress to the property is via an access drive on 31st Street, an access drive on Kemman, and via the public alley. The property is zoned C-1 Commercial and is currently improved with a single story building (1,447 square feet) and an asphalt parking lot. The existing use is Murphy's Transmission and Complete Auto Repair. The petitioner requests to expand the existing structure and use, which requires a special use permit, site plan review and certain variations from the Zoning Code.

PROPOSED IMPROVEMENTS

The petitioner is proposing to construct two building additions onto the existing structure. The west addition is 392 square feet (14' x 28'). This addition will connect to the existing auto repair bays via an interior door. An exterior door located on the north side of the addition will provide access to the loading area. An overhead door which matches the existing overhead doors in size and style will be located on the south side of the addition. According to the petitioner, the west addition will be used primarily for tool and material storage.

The proposed east addition will be located on the east side of the existing building, along Kemman Avenue. The east addition is 1,449 square feet (28' x 51.75'). The addition will connect to a hallway in the existing building via an interior door. An exterior door is also proposed on the west side of the east addition leading to an outdoor employee area. The east addition will include two truck bays, a restroom, an employee locker room and an employee lounge with kitchen facilities (refrigerator and sink). A mezzanine level located on the north side of the addition will house mechanicals. Two overhead doors will be located on the south side of the addition.

The interior of the existing building will not be significantly altered, aside from the addition of a fire suppression system. The existing office, public restroom and hallway will remain. The existing parking lot will be reconstructed and reconfigured to bring the property into closer compliance with the Zoning Code. A dumpster enclosure is proposed at the northwest corner of the subject property, which complies with the Zoning Code. The existing wall signage will be removed and relocated over the new east addition. The existing phone booth located at the southwest corner of the parking lot and the existing concrete block located at the southeast corner of the parking lot will be removed.

Parking & Loading

The Zoning Code requires a total of 10 parking stalls be provided on-site, based on the number of bays and the size of the public areas. The petitioner is proposing a total of 13 parking stalls, including one handicap stall. The petitioner believes the additional parking is needed for his operations.

The Zoning Code also requires the provision of a loading area for a commercial use. The petitioner has proposed to locate the loading area at the rear of the property in accordance with the Zoning Code. Due to site constraints, the petitioner is unable to meet the required 30' loading area length (25' is proposed) and is unable to enclose or screen the loading area as required by the Zoning Code. *Please see the petitioner's application for additional details.*

The Zoning Code requires all commercial properties provide delineated and visible pedestrian access from parking areas to building entrances. The petitioner is providing a striped walkway located adjacent to the south side of the building and a striped walkway from the public building entrance to the parking lot in order to address this requirement.

Landscaping - Perimeter

Three feet of perimeter landscaping will be provided along the southern border of the property. While the Zoning Code requires 10' feet of perimeter landscaping, due to the existing configuration of the property and the current and anticipated use of the parking area, only three feet of landscaping can be provided. The petitioner has submitted truck turning exhibits demonstrating the need to maintain the majority of the existing parking field thereby reducing the ability to widen the perimeter parking lot landscaping. Although not required by the Zoning Code, the petitioner is proposing to install landscaping along the western perimeter of the parking lot and a three foot tall "knee wall" to provide additional buffering between the subject property and the adjacent property to the west. The petitioner is also proposing to install 1" 8" planter running the entire length of the east wall of the east addition. This is not required by the Zoning Code, but will enhance the aesthetic appeal of the property, soften the view of the east building wall from the right-of-way, and incorporate additional green space onto the property.

Landscaping - Interior Parking Lot

The Zoning Code requires parking lot islands be provided at the end of each parking row. Due to the parking lot configuration, a total of six parking lot islands are required. The petitioner is unable to comply with this provision of the Zoning Code as it would require the loss of additional parking stalls, which would result in the use failing to meet the minimum parking requirements. Additionally, as illustrated in the truck turning exhibits submitted by the petitioner, if additional parking lot islands were to be incorporated into the south parking lot, utilization of the lot would be significantly compromised. Thus, the petitioner is proposing to install an oversized parking lot end island (10' in width vs. 8.5') at the southeast corner of the property. This island has been increased in size to accommodate an existing light pole and will be landscaped in accordance with the Zoning Code.

Storm Water Management

The existing site is made up of 100% impervious surface. As the petitioner is proposing to reduce the amount of impervious surface through the addition of perimeter and parking lot landscaping, no additional storm water management is required.

ZONING REQUESTS

The petitioner is requesting a Special Use Permit for “motor vehicle service and repair, minor”. Under Section 153.131, Table 8-1 and Section 153.177(N), the following regulations apply to this use:

- 1) *“Minor motor vehicle service and repair shops may not store the same vehicles outdoors on the site for longer than ten days.*

The petitioner has confirmed he will comply with this requirement.

- 2) *All driveways must be located and designed to ensure that they will not adversely affect the safety and efficiency of traffic circulation on adjoining streets.*

There are no proposed changes to the existing ingress and egress of the subject property.

- 3) *All repair operations shall be fully enclosed. Wrecked or junked vehicles shall not be stored for longer time periods than those specified above and shall be screened from the public right-of-way and any adjacent residential districts.”*

The petitioner has confirmed he will comply with this requirement.

The petitioner is requesting the following variations from the Zoning Code including:

- a) From Section 153.218(B) to reduce the required loading berth length from 30’ to 25’.
- b) From Section 153.218(4) of to reduce the minimum required distance from an unenclosed loading berth to a residential property line from 50’ to approximately 18’.
- c) From Section 153.211(B)(2) to allow for off-street parking in the front yard setback of in the C-1 zoning district.
- d) From Section 153.238(B) to reduce the minimum required width of perimeter parking lot landscaping from 10’ to 3’.
- e) From section 153.239(A) to reduce the required number of interior parking lot islands from six to one.

Additionally, Section 153.242(B) of the Zoning Code requires:

“Loading berths in all zoning districts shall be screened as much as possible, unless such screening is determined unnecessary by the body approving the landscape plan. Such screening shall consist of an opaque masonry wall (stone, stucco or brick), a solid wood or simulated wood screen fence, or dense evergreen hedge, at least six (6) feet in height.”

The petitioner has requested the Planning & Zoning Commission and the Village Board make a finding that screening of the loading berth is unnecessary.

ANALYSIS: SPECIAL USE PERMIT FOR MOTOR VEHICLE SERVICE & REPAIR, MINOR

The Zoning Code requires a special use meet the following criteria in order to be granted:

- a. The establishment, maintenance and operation of the special use in the specific location proposed will not endanger the public health, safety or general welfare of any portion of the community.***

The motor vehicle service and repair use is an existing use that has been in operation on this site for over twenty years. The property is bordered on three sides by commercial uses. While the property is bordered to the north by single-family homes, a 16' public alley separates the uses. All activity on the site is oriented toward the front of the building on the south side of the property, minimizing disruptions to the adjacent single-family uses. All repair activity will occur inside the building and only small scale loading will occur in the rear (north side) of the building. The impact on adjacent properties is not anticipated to change with the building/use expansion. *Please see the petitioner's application for additional details.*

- b. The proposed special use is compatible with adjacent properties and/or other properties within the immediate vicinity of the special use.***

The use is located in a commercial district and is bordered by commercial uses to the east, south and west. The subject property is a corner lot that fronts four lane roadways to both the south and east. This a high traffic corner and the intensity of the use is appropriate given the location. While the property is bordered to the north by single-family homes, a 16' public alley separates the uses. This is characteristics of all of the commercial properties located along the 31st Street corridor. *Please see the petitioner's application for additional details.*

- c. The special use in the specific location proposed is consistent with the spirit and intent of the Zoning Code and Comprehensive Plan.***

Both the Zoning Code and Comprehensive Plan designate this property for commercial uses. The automotive repair use is a designated special use within the C-1 zoning district and provides a service to the local community. The C-1 commercial district seeks to "promote development of storefront space and provide for a mix of retail, personal service and office uses along the commercial corridors within the village." The existing business has been in operation for over 20 years, demonstrating an ongoing need for this type of service in the community. *Please see the petitioner's application for additional details.*

ANALYSIS: VARIATIONS

According to the Zoning Code, a variation request must meet each of the following criteria in order for a variance to be granted.

a. Undue Hardship

Will the strict application of the terms of the Zoning Code result in undue hardship unless specific relief is granted?

The petitioner is requesting several variations due to existing configuration of the property. The petitioner is unable to comply with the Zoning Code, Section 153.211(B)(2), which requires all off-street parking in the C-1 district to be located in the rear of the building. The current building and parking is existing and in order to comply with the Zoning Code, the entire property would have to be demolished and reconfigured. This is financially unfeasible.

The petitioner is unable to comply with the loading requirements of the Zoning Code, Sections 153.218(B)/153.218(4), due to the proximity of the existing building to the adjacent residential properties. The petitioner's parts and supplies are delivered in small-to-medium sized trucks (not semi-trailers) and a large loading area is not necessary to meet the needs of his business. In order to meet the loading area length requirement or enclosure requirement, the proposed dumpster would have to be relocated further east and north, closer to the residential properties and the Kemman Avenue right-of-way, potentially detrimentally impacting the adjacent single-family residences.

The petitioner is unable to comply with the landscaping requirements of the Zoning Code, Sections 153.238(B)/153.239(A), due to existing site configuration. The petitioner has demonstrated via the submitted truck turning exhibits that installation of additional landscaping would reduce the parking field to a size that makes it unsafe and unusable for the vehicles and small trucks that he services, thereby making it unfeasible for the business to operate. *Please see the petitioner's application for additional details.*

b. Unique Circumstances

Is the plight of the owner due to unique circumstances inherent to the subject property and not from the personal situation of the owner?

All of the requested variations are due to the unique circumstances that are inherent to the existing configuration of the subject property. The petitioner/property owner purchased the property over 20 years ago in its current configuration. The petitioner is unable to comply with the five noted requirements of the Zoning Code due to the location of the existing building in proximity to the parking lot, the need for vehicles of varying sizes to maneuver through the parking field and the desire to mitigate the impacts of the use on adjacent single-family property owners. *Please see the petitioner's application for additional details.*

c. Essential Character of the Locality

Would the variation, if granted, alter the essential character of the locality?

The proposed use is an expansion of the existing use. Both building additions will be constructed in a manner similar in material and style to the existing building. The reconstruction of the parking lot and the addition of landscaping (of which there is currently none) will significantly improve the aesthetics of the subject property. The proposed improvements are consistent with the existing structure and surrounding properties and will enhance the overall appearance of the street front. *Please see the petitioner's application for additional details.*

ANALYSIS: SITE PLAN REVIEW

The proposed site plan complies with the Zoning Code with the noted exceptions for which variations have been requested. The Zoning Code outlines standards for site plan review, which have been attached for the Commission's reference. The stated purpose of Site Plan review is to:

"Promote orderly development and redevelopment in the village, and to assure that such development or redevelopment occurs in a manner that is harmonious with surrounding properties, is consistent with the Comprehensive Plan, and promotes the general welfare of the village."

Staff finds the proposed site improvements fulfill the intent and standards of site plan review by providing for reinvestment within the Village's commercial district, enhancing the aesthetics of the property, minimizing impacts on adjacent properties and bringing the property into closer compliance with the Zoning Code.

STAFF RECOMMENDATION

Staff believes the standards have been met for the Special Use Permit and recommends the Planning and Zoning Commission make the following motion:

Motion to recommend to the Village President and Board of Trustees approval of a Special Use Permit for motor vehicle service and repair, minor, for 1117 E. 31st Street.

Staff believes the standards have been met for the requested variations and recommends the Planning and Zoning Commission make the following motion:

Motion to recommend to the Village President and Board of Trustees approval of the following variations for 1117 E. 31st Street:

- a) From Section 153.218(B) to reduce the required loading berth length from 30' to 25'.***
- b) From Section 153.218(4) of to reduce the minimum required distance from an unenclosed loading berth to a residential property line from 50' to approximately 18'.***

- c) *From Section 153.211(B)(2) to allow for off-street parking in the front yard setback of in the C-1 zoning district.*
- d) *From Section 153.238(B) to reduce the minimum required width of perimeter parking lot landscaping from 10' to 3'.*
- e) *From section 153.239(A) to reduce the required number of interior parking lot islands from six to one.*

Staff believes the standards for Site Plan Review have been met and recommends the Planning and Zoning Commission make the following motion:

Motion to grant site plan approval for 1117 E. 31st Street in accordance with the Improvement Plans for Murphy's Auto Repair, as prepared by M.A.G. Architect and Code Consulting, Inc., consisting of eight (8) sheets, dated May 15, 2020 and revised through August 17, 2020; subject to the following conditions:

- 1. That in accordance with 153.242(B) of the Zoning Code, the Village President and Board of Trustees find that screening of the loading berth is unnecessary; and***
- 2. That a special use permit for motor vehicle service and repair, minor is approved by the Village President and Board of Trustees; and***
- 3. That variations from Sections 153.218(B), 153.218(4), 153.211(B)(2), 153.238(B); and 153.239(A) are approved by the Village President and Board of Trustees.***

DOCUMENTATION

- Standards for Site Plan Review
- Application for a Special Use Permit
- Application for Zoning Variation
- Application for Site Plan Review
- Site Improvement Plans
- Review Letter from Hancock Engineering
- Letter to Adjacent Property Owners/Public Hearing Notice

C: Larry Dziurdzik, Allen L. Kracower & Associates, Inc. – Representative for Petitioner
 Michael Engel – Petitioner
 Julia Cedillo, Village Manager
 Dean Maggos, Director of Fire & Building
 Patrick Boyle, Building Official
 Cathy Keating, Village Attorney

Standards for Site Plan Review

In evaluating this request, the Zoning Board of Appeals should consider the following standards under Section 153.060(D) of the Village's Zoning Ordinance.

1. Degree of conformity with existing standards.
2. Regulations of this Zoning Code, and any other applicable regulations within the Village's Municipal Code, and the goals and policies of the Comprehensive Plan.
3. The location, arrangement, size, design and general site compatibility of buildings, lighting and signs, including:
 - a. Efficient use of land that responds to the existing off-site utilities and service conditions in order to minimize the demand for additional municipal services, utilities and infrastructure.
 - b. Compatibility with, and mitigation of, any potential impact upon, adjacent property.
 - c. Site illumination designed and installed to minimize adverse impact on adjacent properties.
 - d. Signs in accordance with Section 15 (Signs).
4. Landscaping and the arrangement of open space or natural features on the site should:
 - a. Create a desirable and functional environment for motorists, pedestrians, bicyclists and occupants of residential dwellings, business owners and employees. To achieve such an environment, landscaping may take advantage of open space design features such as bike paths, running paths and outdoor relaxation areas.
 - b. Preserve unique natural resources, including measures to preserve and protect existing healthy, mature trees.
 - c. Protect natural resources and landscaping on adjacent sites.
 - d. Design drainage facilities to promote the use and preservation of natural watercourses and patterns of drainage.
 - e. Utilize plant materials suitable to withstand the climatic conditions of the Village and microclimate of the site. The use of species native to northeastern Illinois is encouraged.
 - f. Use of screening to buffer the impact of the development on adjacent uses and enhance the appearance and image of the Village by screening incompatible uses and certain site elements, and creating a logical transition to adjoining lots and developments.
5. Circulation systems and off-street parking shall be designed to:
 - a. Provide adequate and safe access to the site for motor vehicles as well as alternate modes of transportation, including pedestrians and bicyclists.
 - b. Minimizing potentially dangerous traffic movements.
 - c. Separate pedestrian and auto circulation and provide for bicycle parking or storage insofar as practical.
 - d. Minimize curb cuts by using cross-access easements and shared parking.
 - e. Design off-street parking lots or garages to minimize adverse impacts on adjacent properties, particularly through the use of perimeter and interior landscaping, and promote logical and safe parking and internal circulation.
 - f. Clearly define pedestrian access from the parking area to the building(s). A clearly defined visible and identifiable network of pedestrian connections should be provided in and between parking lots, street sidewalks, open spaces and buildings.

PLANNING OFFICE OF
ALLEN L. KRACOWER & ASSOCIATES, INCORPORATED
URBAN PLANNERS & REAL ESTATE CONSULTANTS

900 NORTH SHORE DRIVE, SUITE 205
LAKE BLUFF, ILLINOIS 60044
TELEPHONE (847) 604-9600
FAX (847) 604-9601

August 5, 2020

Ms. Emily Rodman, AICP
Assistant Village Manager
Village of La Grange Park
447 N. Catherine Avenue
La Grange Park, Illinois 60526

***Re: Revised Murphy's Transmission and Complete Auto Repair Special Use Permit
1117 East 31st Street, La Grange Park, Illinois***

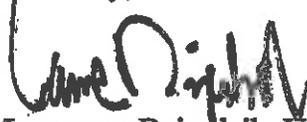
Dear Ms. Rodman,

On behalf of the applicant, Murphy's Transmission and Complete Auto Repair, we are pleased to submit the following revised zoning applications, architectural plans and other required documentation for the proposed improvements at 1117 East 31st Street:

- Revised Application for Zoning Special Use
- Revised Application for Zoning Variation
- Application for Site Plan Review
- Revised Architectural Plans (full size & 11 x 17)

We understand that the Planning and Zoning Commission will convene on Wednesday August 26th to consider our application. We look forward to continuing working with you and other Village staff on this exciting proposal for the community. Please contact me directly with any questions you may have.

Sincerely,



Lawrence Dziurdzik, Vice President, ASLA
ALLEN L. KRACOWER & ASSOCIATES, INC.

CC: Mr. Michael Engel-Owner & Applicant



APPLICATION FOR ZONING SPECIAL USE PERMIT

ADDRESS OF SUBJECT PROPERTY: 1117 E. 31st Street, LaGrange Park

NAME OF APPLICANT(S): Michael Engel

INTEREST IN PROPERTY: Owner

ADDRESS: 1117 E. 31st Street

CITY, STATE, ZIP: La Grange Park, Illinois 60526

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF PROPERTY OWNER/TRUSTEE(S): Michael Engel

ADDRESS: 1117 E. 31st Street

CITY, STATE, ZIP: La Grange Park, Illinois 60526

EMAIL: _____ PHONE: _____ FAX: _____

Planner

NAME OF ATTORNEY (IF APPLICABLE): Allen L. Kracower & Associates, Inc.

ADDRESS: 900 North Shore Drive, Suite 205

CITY, STATE, ZIP: Lake Bluff, Illinois 60044

EMAIL: ldziurdzik@kracower.com PHONE: 847-604-9600 FAX: 847-604-9601

NAME OF ENGINEER (IF APPLICABLE): NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ARCHITECT (IF APPLICABLE): M.A.G. Architect & Code Consultant Inc.

ADDRESS: 208 W. Washington Street, Unit 806

CITY, STATE, ZIP: Chicago, Illinois 60606

EMAIL: magarch007@hotmail.com PHONE: 312-578-0475 FAX: 312-588-0107

VILLAGE PERSONNEL: Provide the following information for any officer or employee of the Village with an interest in the Owner, Applicant, Consultant or the Subject Property and the nature and extent of that interest.

NAME: NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NATURE/EXTENT OF INTEREST: _____



PERMANENT INDEX NUMBER OF SUBJECT PROPERTY (TAX ID NO.): 15-28-430--034, 035, -036, -037

CURRENT ZONING CLASSIFICATION: C-1 Commercial Zoning District

ADJACENT ZONING CLASSIFICATION:

NORTH: R-1 Single Family Residential SOUTH: C-1 Commercial Corridor District
 EAST: C-1 Commercial Corridor District WEST: C-1 Commercial Corridor District

ZONING STANDARDS/STATEMENT OF COMPLIANCE:

REQUIREMENT	CODE SECTION	CODE REGULATION	PROPOSED
MIN. LOT AREA	153.132	None Required	12,500 SF
MIN. LOT WIDTH			
MIN. LOT DEPTH			
MIN. FRONT SETBACK	153.132	Maximum 5 Ft.	63'-9"
MIN. INTERIOR SIDE SETBACK	153.132	None Required	4'-0"
MIN. CORNER SIDE SETBACK	153.132	None Required	1'-8"
MIN. REAR YARD SETBACK	153.132	None Required	9'-4"
BUILDING COVERAGE			
IMPERVIOUS SURFACE COVERAGE			
BUILDING HEIGHT	153.132	45 Ft. but no more than 4 stories	23'-6" to Parapet Wall
BUILDING HEIGHT SETBACK PLANE	NA		
LOADING*	153.217	- 1-loading space	1 loading space
PARKING*	153.216	2 per service bay & 1 per 500 Office & Waiting	5 service bays-10 spaces 12 total spaces provided

**If there are parking or loading requirements for the Subject Property, please provide detailed calculation of both the required and proposed number of spaces.*

REQUIRED DOCUMENTATION: All required documents must be submitted in hard copy (2 copies) and in digital form (1 copy).

- STATEMENT OF AGREEMENT TO REIMBURSE COSTS (separate document)
- PROOF OF OWNERSHIP (current title policy report or deed and current title search)
- LEGAL DESCRIPTION
- PLAT OF SURVEY (certified by registered land surveyor)
- NEIGHBORING OWNERS/AFFIDAVIT OF MAILING* (see page 3)



* The Applicant must notify the occupants/tax assessesees (as shown on the records of the Proviso Township Assessor) of all properties located within 250 feet of the boundary lines of the Subject Property, excluding public rights-of-way (see §3.3 of Zoning Code) of the date, time, place and purpose of the hearing on the Special Use Permit. The Village will prepare a legal Notice of Hearing. Applicant must mail the Notice not less than 15 nor more than 30 days prior to the scheduled hearing date to all occupants/tax assessesees. The applicant/agent must then fill out, sign, and notarize the Affidavit of Mailing form, returning that form and the list of all persons, addresses and PIN numbers to which Notice was sent, to the Village.

SUMMARY OF PROPOSED SPECIAL USE: (Attach additional pages if necessary)

The existing use at the subject property is an automotive repair facility. This use is considered a special use under the C-1 zoning district. In addition to the land use request, the applicant is expanding the building to include 2 additional service truck bays, a second story mezzanine, an equipment bay, parking signage and landscaping. The architectural design will match the existing building materials with a focus on a 2-story building element above the new truck service bays doors. The existing wall signage will be relocated to the 2-story building addition. The sign area will not exceed 100 square feet.

ORDINANCE PROVISION: The specific provisions of the Zoning Code classifying the proposed use as a Special Use: 153.131 Permitted and Special Uses; Table 8-1; Motor Vehicle Service and Repair, Minor; C-1 Special Use

APPROVAL STANDARDS FOR A SPECIAL USE PERMIT: No Special Use Permit shall be granted unless the Planning and Zoning Commission and the Village Board of Trustees make specific written findings based upon the standards noted below. Please provide the specific facts you believe support each of the required special use standards (you may attach additional pages if necessary).

- a. *The establishment, maintenance and operation of the special use in the specific location proposed will not endanger the public health, safety or general welfare of any portion of the community.*

 See Special Use Standard Attachments.

- b. *The proposed special use is compatible with adjacent properties and/or other properties within the immediate vicinity of the special use.*

 See Special Use Standard Attachments.

- c. *The special use in the specific location proposed is consistent with the spirit and intent of the Zoning Code and Comprehensive Plan.*

 See Special Use Standard Attachments.



OWNER/APPLICANT REPRESENTATIONS:

The Owner states that he and/or she consent to the filing of this application and that all information contained herein is true and correct to the best of his and/or her knowledge.

Name of Owner (print): Michael Engel Date: 7-21-20

Signature of Owner: *Michael Engel* Date: 7-21-20

The applicant certifies that all of the information contained in this application is correct to the best of applicant's knowledge. The applicant understands that an incomplete or nonconforming application will not be considered. In addition, the applicant understands that the Village may require additional information prior to the consideration of this application.

Name of Applicant (print): Michael Engel Date: 7-21-20

Signature of Applicant: *Michael Engel* Date: 7-21-20

REVOCATION OF SPECIAL USE PERMIT

A special use permit may be revoked by the Village Board after a finding of the existence of any one of the following conditions or occurrence of any of the following events: 1) the operation of the special use ceases for a continuous period of 180 days; 2) the licenses or permits required for the operation or maintenance of the special use are not obtained or are subsequently terminated; 3) any of the provisions of the Zoning Code or the terms and conditions of the ordinance approving the special use are violated; 4) a building permit for the construction of the structure(s) for which the special use permit was granted is not issued (through no fault of the Village) within 1 year of the date on which the Village Board granted the special use permit; or 5) construction of the structure(s) for which the special use permit was granted is not completed within 2 years of the date on which the Village Board granted the special use permit.

CONDITIONS AND RESTRICTIONS ON SPECIAL USES

The Planning and Zoning Commission may recommend, and the Village Board may impose, such conditions and restrictions upon a special use permit as may be necessary or appropriate to protect the public interest, adjacent properties and property values. Failure to maintain such conditions and restrictions shall constitute grounds for revocation of the special use permit. The special use permit granted, as well as any conditions or restrictions imposed in connection with the special use shall be set forth in the ordinance approving the special use permit.

SIGN REQUIREMENTS FOR ALL PUBLIC HEARINGS

Under Section 3.3C of the Zoning Code, a sign provided by the Village of La Grange Park must be posted in front of the property at least 15 days, but not more than 30 days prior to the scheduled hearing. The Applicant must maintain the sign during the required time period.

APPLICATION FEE

An application fee of \$500.00, payable to the Village of La Grange Park, must accompany this Application.

REIMBURSEMENT OF FEES REQUIRED DEPOSIT AMOUNT

A deposit in the amount of \$1,000.00, payable to the Village of La Grange Park, must accompany this Application and the executed Reimbursement of Fees Agreement.

Approval Standards for a Special Use Permit:

a. The establishment, maintenance and operation of the special use in the specific location proposed will not endanger the public health, safety or general welfare of any portion of the community.

Murphy's Transmission and Auto Repair has been in business for over 20 years at the current location. The 1 story building has existed on the property in the same location for over 76 years. The property is accessible from 31st Street, an arterial street that serves the 31st Street Commercial Corridor. The applicant has been operating the current land use on the subject property in a professional manner for over 20 years and has been soundly integrated within the community at this location. The applicant respects and provides a safe environment for his neighbors and community by maintaining the building's appearance, lighting, parking, trash and grounds, while abiding by the noise ordinance and hours of operation. Automotive services conducted on the subject property are performed by qualified mechanics under the direct supervision of the owner and applicant. We believe Murphy's Transmission and Auto Repair is not detrimental to the public health, safety or general welfare to any portion of the community including employees or customers of Murphy's Transmission and Auto Repair.

b. The proposed special use is compatible with adjacent properties and / or other properties within the immediate vicinity of the special use.

The proposed special use is compatible with nearby properties and other properties in the immediate vicinity for the following reasons; commercial land uses exist to the east, south and west of the subject property. An alley separates the subject property from the residential land uses located north. The proposed special use and nearby uses are compatible with one another and from a land use and zoning perspective are considered reasonable. A few of the existing nearby commercial uses are; Vaupell Auto Repair is located south of the subject property, PNC Bank is located east of the property and medical office uses are located west of the subject property. The character of the neighborhood along the 31st Street commercial corridor consists of numerous retail, professional and service oriented small businesses. Most businesses, including Murphy's Transmission operate on a neighborhood scale providing a desirable and convenient service to local residents of La Grange Park. The proposed land use that has coexisted with adjacent properties for over 20 years will not adversely impact the use and enjoyment of those nearby properties or Village residents.

c. The special use in the specific location proposed is consistent with the spirit and intent of the Zoning Code and Comprehensive Plan.

The special use is located on property that is zoned C-1 which is consistent with the zoning map that designates this area as C-1 Commercial District. The automotive service is specifically identified as a special use in the Zoning Code within the C-1 Zoning District. The June 2006 Comprehensive Land Use Plan identifies and defines this property as a 31st Street Corridor land use with a "pedestrian friendly environment that serves as a retail, professional and personnel service center." The special use provides the community with a desirable service in an area that is appropriate, convenient and will contribute to the general welfare of the neighborhood or community and will encourage the orderly re-development of nearby properties.



APPLICATION FOR ZONING VARIATION

ADDRESS OF SUBJECT PROPERTY: 1117 E. 31st Street, LaGrange Park

NAME OF APPLICANT(S): Michael Engel

INTEREST IN PROPERTY: Owner

ADDRESS: 1117 E. 31st Street

CITY, STATE, ZIP: LaGrange Park, Illinois 60526

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF PROPERTY OWNER/TRUSTEE(S): Michael Engel

ADDRESS: 2253 Stonehaven Drive

CITY, STATE, ZIP: Plainfield, Illinois 60586

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ATTORNEY (IF APPLICABLE): Planner Allen L. Kracower & Associates, Inc.

ADDRESS: 900 North Shore Drive Suite 205

CITY, STATE, ZIP: Lake Bluff, Illinois 60044

EMAIL: ldziurdzik@kracower.com PHONE: 847-604-9600 FAX: _____

NAME OF ENGINEER (IF APPLICABLE): NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ARCHITECT (IF APPLICABLE): M.A.G. Architect & Code Consultant Inc.

ADDRESS: 208 W. Washington Street Unit 806

CITY, STATE, ZIP: Chicago, Illinois 60606

EMAIL: magarch007@hotmail.com PHONE: 312-578-0475 FAX: 708-588-0107

VILLAGE PERSONNEL: Provide the following information for any officer or employee of the Village with an interest in the Owner, Applicant, Consultant or the Subject Property and the nature and extent of that interest.

NAME: NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NATURE/EXTENT OF INTEREST: _____



PERMANENT INDEX NUMBER OF SUBJECT PROPERTY (TAX ID NO.): 15-28-430-034, 035, -036, -037

CURRENT ZONING CLASSIFICATION: C-1 Commercial Corridor Zoning District

ADJACENT ZONING CLASSIFICATION:

NORTH: R-1 Single Family Residential

SOUTH: C-1 Commercial Corridor District

EAST: C-1 Commercial Corridor District

WEST: C-1 Commercial Corridor District

ZONING STANDARDS/STATEMENT OF COMPLIANCE:

REQUIREMENT	CODE SECTION	CODE REGULATION	PROPOSED
MIN. LOT AREA	153.132	None Required	12,500 SF
MIN. LOT WIDTH	NA		
MIN. LOT DEPTH	NA		
MIN. FRONT SETBACK	153.132	Maximum 5 Ft.	63'-9"
MIN. INTERIOR SIDE SETBACK	153.132	None Required	4'-0"
MIN. CORNER SIDE SETBACK	153.132	None Required	1'-8"
MIN. REAR YARD SETBACK	153.132	None Required	9'-4"
BUILDING COVERAGE			
IMPERVIOUS SURFACE COVERAGE			
BUILDING HEIGHT	153.132	45 Ft. but no more than 4 stories	23'-6" to Parapet Wall
BUILDING HEIGHT SETBACK PLANE	NA		
LOADING*	153.217	1 loading space	
PARKING*	153.216	2 per service bay & 1 per 500 Office & Waiting	5 service bays-10 spaces 12 total spaces

**If there are parking or loading requirements for the Subject Property, please provide detailed calculation of both the required and proposed number of spaces.*

REQUIRED DOCUMENTATION: All required documents must be submitted in hard copy (2 copies) and in digital form (1 copy).

- STATEMENT OF AGREEMENT TO REIMBURSE COSTS (separate document)
- PROOF OF OWNERSHIP (current title policy report or deed and current title search)
- LEGAL DESCRIPTION
- PLAT OF SURVEY (certified by registered land surveyor)
- DRAWING (TO SCALE) DEPICTING PROPOSED IMPROVEMENTS
- NEIGHBORING OWNERS/AFFIDAVIT OF MAILING* (see page 3)



* The Applicant must notify the occupants/tax assesses (as shown on the records of the Proviso Township Assessor) of all properties located within 250 feet of the boundary lines of the Subject Property, excluding public rights-of-way (see §3.3 of Zoning Code) of the date, time, place and purpose of the hearing on the Variation. The Village will prepare a legal Notice of Hearing. Applicant must mail the Notice not less than 15 nor more than 30 days prior to the scheduled hearing date to all occupants/tax assesses. The applicant/agent must then fill out, sign, and notarize the Affidavit of Mailing form, returning that form and the list of all persons, addresses and PIN numbers to which Notice was sent, to the Village.

SUMMARY OF PROPOSED VARIATION: A statement of the precise variation being sought, the purpose therefor, and the specific feature of features of the proposed use, construction, or development.

See attachment

ORDINANCE PROVISION: The specific provisions of the Zoning Code from which a variation is sought:
See attachment

MINIMUM VARIATION: A statement of the minimum variation of the provisions of the Zoning Ordinance that would be necessary to permit the proposed use, construction, or development.
See attachment

APPROVAL STANDARDS FOR A VARIATION: No variation from the provisions of the Zoning Code shall be granted unless the Planning and Zoning Commission and the Village Board of Trustees make specific written findings based upon the standards noted below. Please provide the specific facts you believe support each of the required variation standards (you may attach additional pages if necessary).

- a. *The strict application of the terms of the Zoning Code will result in undue hardship unless the specific relief requested is granted.*

See attachment

- b. *The plight of the owner is due to unque circumstances inherent to the Subject Property and not from the personal situation of the owner.*

See attachment



c. *The variation, if granted, will not alter the essential character of the locality.*

See attachment

EVIDENCE RELEVANT TO STANDARDS FOR A VARIATION: You may attach a statement, present testimony or evidence and the Planning and Zoning Commission and the Village Board of Trustees may inquire into the following issues, as well as any others deemed appropriate:

- a. The particular physical surroundings, shape or topographic conditions of the Subject Property impose a particular hardship upon the owner, as distinguished from a mere inconvenience, if the strict letter of the regulations were to be carried out.
- b. The alleged difficulty or hardship has not been created by any person presently having a proprietary interest in the Subject Property.
- c. The granting of the variation will not be detrimental to the public welfare in the neighborhood in which the Subject Property is located.
- d. The proposed variation will not impair an adequate supply of light and air to adjacent property, substantially increase congestion in the public streets, increase the danger of fire, endanger the public safety or impair property values within the neighborhood.
- e. The proposed variation is consistent with the spirit and intent of the Zoning Code and the Village's Comprehensive Plan.
- f. The value of the Subject Property will be substantially reduced (as compared with other properties in the same zoning district) if permitted to be used only under the conditions allowed by regulations governing that zoning district.

OWNER/APPLICANT REPRESENTATIONS:

The Owner states that he and/or she consent to the filing of this application and that all information contained herein is true and correct to the best of his and/or her knowledge.

Name of Owner (print): Michael Engel Date: 7-21-20

Signature of Owner:  Date: 7-21-20

The applicant certifies that all of the information contained in this application is correct to the best of applicant's knowledge. The applicant understands that an incomplete or nonconforming application will not be considered. In addition, the applicant understands that the Village may require additional information prior to the consideration of this application.



VILLAGE OF LA GRANGE PARK • ADMINISTRATION DEPARTMENT
 447 N. CATHERINE AVE, IL 60526 • PHONE (708) 354-0225 • FAX (708) 354-0241

APPLICATION FEE: \$500
 DEPOSIT: \$1,000

Name of Applicant (print): Michael Engel Date: 7-21-20
 Signature of Applicant: *Michael Engel* Date: 7-21-20

LIMITATIONS ON VARIATIONS; REVOCATION

No variation shall be granted for relief prohibited by Section 4.3D of the La Grange Park Zoning Code.

No ordinance granting a variation shall be valid for a period longer than 180 days from the effective date of such ordinance. The Applicant must obtain a building permit for the particular construction or improvement for which the variation was issued and commence the construction or alteration within such 180 day period. The Planning and Zoning Commission may recommend, and the Village Board may grant, one (1) extension of this 180-day period, valid for not more than an additional 180 days, upon written application and good cause shown.

CONDITIONS AND RESTRICTIONS ON VARIATIONS

The Planning and Zoning Commission may recommend, and the Village Board may impose, such conditions and restrictions upon the location, construction, design and use of the Property benefitted by a variation as may be necessary or appropriate to protect the public interest, adjacent properties and property values. Failure to maintain such conditions and restrictions as may be imposed shall constitute grounds for revocation of the variation. The variation granted, as well as any conditions or restrictions on that variation, shall be set forth in the ordinance approving the variation.

SIGN REQUIREMENTS FOR ALL PUBLIC HEARINGS

Under Section 3.3C of the Zoning Code, a sign provided by the Village of La Grange Park must be posted in front of the property at least 15 days, but not more than 30 days prior to the scheduled hearing. The Applicant must maintain the sign during the required time period.

APPLICATION FEE

An application fee of \$500.00, payable to the Village of La Grange Park, must accompany this Application.

REIMBURSEMENT OF FEES REQUIRED DEPOSIT AMOUNT

A deposit in the amount of \$1,000.00, payable to the Village of La Grange Park, must accompany this Application and the executed Reimbursement of Fees Agreement.

Revised February 2018

Summary of Proposed Variations:

The applicant is seeking the following variations from the Zoning Code:

- 1) Section 153.238; Parking Lot Perimeter Landscape Yard;** a 10' landscape yard measured from the lot line to the back of curb in order to accommodate vehicle bumper overhang and ensure planting areas that are adequate in size. The proposed site plan provides a 3' landscape yard from 31st Street. Safe ingress and egress to and from the subject property is maintained by a 3' wide landscape yard while providing adequate turning movements for flat bed tow truck's and certain larger SUV's. A larger landscape yard cannot be achieved given the existing building setback from the front yard property line and necessary required parking. Please refer to the turning movement exhibits prepared by our Civil Engineer Cross Engineering.
- 2) Section 153.239; Interior Parking Lot Landscaping;** All rows of parking spaces shall be terminated by a parking lot island or landscape area. Parking has been provided north and south of the building and proposed expansion areas. Interior or end parking lot islands cannot be provided at all parking areas as the area allocated for site circulation, parking, loading and trash provisions limit the amount of interior landscape that can be provided. A landscape island located at the southeast parking area along 31st Street and Kemman Avenue has been provided and made part of this special use permit.
- 3) Section 153.218 (B);** All required off street loading spaces shall be at least twelve (12) feet in width and at least thirty (30) feet in length, exclusive of aisle and maneuvering space, and shall be a minimum vertical clearance of at least fourteen (14) feet. The loading space is located at the rear of the building and is dimensioned at 12' by 25' in size. The loading space cannot increase in size due to the location of the building on the property and public alley located north. We believe this is the best location as it is located at the rear of the building and nearby to the trash enclosure. Full enclosure of the loading space is not practical as maneuvering space will be removed
- 4) Section 153.218 (4);** All off-street loading spaces shall be located a minimum of fifty (50) feet from the lot line of any lot in a residential district, unless completely enclosed by the building walls or a uniformly painted solid fence or wall, or any combination thereof, not less than six (6) feet in height.

The proposed loading space is located at the rear of the building. Residential zoning is located north of the subject property across a public alley. The loading space can only be a certain size given the pre-existing condition of the building size and its location on the lot, proximity of the building to the alley and existing residential zoning located north. The setback created is the result of numerous pre-existing factors, none of which were created by the Owner.

5) Section 153.211 (B) (2); Off-street Parking is prohibited in the front yard in the C-1 zoning district.

The parking located in the front yard is existing and is vital for the Owner's business to continue to operate. Relocating the parking spaces to another location on the subject property is not practical as the size of the subject property can only yield so many parking stalls while maintaining safe ingress and egress, proper drive aisles, and truck maneuvering.

α. The strict application of the terms of the Zoning Code will result in undue hardship unless the specific relief requested is granted.

The property has been used for an automotive repair business by the Owner for over 23 years. The existing building, parking and property in general have been operational and functional throughout this period of time and have allowed the Owner to use the property efficiently. Historically the entire property has served a purpose, i.e.; parts and miscellaneous automotive deliveries, trash pick-up, parking for cars to be repaired, parking for cars complete and ready for pick-up, employee parking and staging area for cars being delivered by tow trucks. As the size of the property is only 12, 500 square feet, the applicant has utilized every square foot for some purpose. The location of the existing building, currently being used by the Owner was located on the property prior to the Owner's purchase. The building setback from 31st Street allows for parking along 31st Street, an adequate drive aisle for car and truck maneuvering and a landscape yard. Currently the property does not have landscape space. The proposed site plan incorporates the building additions, parking spaces, landscaping where possible, and a loading area at the back of the building and additionally provides adequate pavement for mid-size trucks to maneuver in and out of the new service bay areas. Parking spaces have been carefully sited to eliminate parking and mid-size truck maneuvering conflicts; however this requires a smaller front landscape yard and the elimination of a landscape end island for the parking located along the west property line. If a 10' yard were to be provided along 31st Street, parking would extend into the main circulation drive aisle prohibiting a turning maneuver by a truck, larger SUV or flatbed tow into the new truck bay addition. This will result in an undue hardship for the applicant which effectively diminishes the applicants desire to expand the business from only car and van repair to mid—size trucks. By granting the requested variance, the Owner is not seeking a special privilege or an additional right not available to owners or occupants of other lots subject to the same zoning provisions.

b. The plight of the owner is due to unique circumstances inherent to the Subject property and not from the personal situation of the owner.

The property does have a very unique set of circumstances that pre-existed prior to the Owner purchasing the property. The location and orientation of the building has pre-existed for over 75 years. The building setback from 31st Street is a dimension that cannot be changed. The Owner and architect of record have determined that a minimum dimension of 42' is required for proper ingress and egress from the new truck service bays between the building and parking along 31st Street. Access into the property from 31st Street or Kemman Avenue is safe, efficient and will not interfere with traffic on either one of the previously mentioned streets. A 3' wide fully landscaped deciduous hedge will be provided along 31st Street and the west property line.

The property in its current layout and configuration has met the Owner's business goals for the past 20 years, however, as with all successful business plans, the need to grow and expand has given rise to a change in how the building is used and how the property is organized and utilized. The Owner has submitted a site plan that from a planning perspective works with the pre-existing size of the property, depth of the property and location of the building. The proposed plan will not adversely impact the surrounding neighborhood and in our opinion the proposed site development cannot occur without the requested variations which cannot be avoided to permit a reasonable use of the property.

c. The variation, if granted will not alter the essential character of the locality.

The granting of the variances will not alter the essential character of the neighborhood, in fact granting of the requested variances will only improve and add to the character of the neighborhood by presenting new architectural and landscape streetscape enhancements along 31st Street. The current property does not have any designated space for landscape. The Owner's plan provides landscape plantings along 31st Street that will add to the streetscape character and promote the Village's ability to attract new orderly redevelopments along this commercial corridor.

Evidence Relevant to Standards for a Variation:

a. The particular physical surroundings, shape or topographic conditions of the Subject Property impose a particular hardship upon the owner, as distinguished from a mere inconvenience, if the strict letter of the regulations were to be carried out.

The properties dimensional size (length and width) and location of the existing building contribute to certain hardships for the Owner. The property dimensional conditions can be considered site constraints and are pre-existing to the Owners purchase of the property and were not created by the Owner. The building's setback from 31st Street dictated and set the

dimensions that were available for site planning purposes. A safe and efficient site plan was created that allowed the following planning components to be developed: parking along 31st Street was necessary to achieve required spaces per ordinance; turning and maneuvering distances were adequate for ingress and egress from 31st Street and Kemman Avenue; safe access was provided to the new truck service bays; drive aisles are wide enough for car turning movements and a landscape buffer was provided.

b. The alleged difficulty or hardship has not been created by any person presently having a proprietary interest in the Subject Property.

The hardship was not created by the Owner or any other person presently having a proprietary interest in the Subject Property.

c. The granting of the variation will not be detrimental to the public welfare in the neighborhood in which the Subject Property is located.

The granting of the variance will not be detrimental to the public welfare and will be quite the opposite. The granting of the variance will only promote the health and well-being of the community by providing a fully attractive operational business that will contribute to the Villages economic sustainability. Prosperous business's only encourage the orderly redevelopment of nearby properties and serve to strengthen and reinforce existing ongoing commercial land use patterns within areas of the Village.

d. The proposed variation will not impact an adequate supply of light and air to adjacent property, substantially increase congestion in the public streets, increase the danger of fire, endanger the public safety or impair property values within the neighborhood.

The proposed variation will not impact an adequate supply of light and air to adjacent properties, nor increase congestion in the public streets. The special use conforms to the Village's bulk requirements in terms of height and size of the building and setbacks from all yards. The variation requested is for a deviation from the landscape code to allow adequate site circulation to the new building addition as well internal vehicular and truck movements from 31st Street and Kemman Avenue. The proposed variation will not have an impact on traffic congestion to nearby public streets nor will it increase the danger of fire or public safety. The variation would allow a reasonable development to occur without placing undue burden on public utilities and facilities. There is no indication that there will be any adverse impact to the values of adjacent properties as the proposed special use has been present for over 20 years. There is a reasonable probability that the development of the subject property will serve to gentrify the area with a contemporary attractive use and higher assessed valuations which will have a positive impact on the value of non-residential properties.

e. The proposed variation is consistent with the spirit and intent of the Zoning Code and the Village's Comprehensive Plan.

The proposed variation is a deviation from the landscape code to allow the Owner to proceed with the special use permit. Landscaping requirements has been made park of the Village Code and the Owner is implementing certain requirements where possible while providing a safe environment for customers and employees. The Village's Comprehensive Plan describes the Community Character vision by recommending that commercial areas promote the use of building designs, signage and landscaping to enhance the attractiveness of commercial areas and provide a sense of place. Granting the requested variance will provide the Village with an attractive property that meets the spirit, goals and objectives of the Comprehensive Plan.

f. The value of the Subject Property will be substantially reduced (as compared with other properties in the same zoning district) if permitted to be used only under the conditions allowed by regulations governing that zoning district.

The size and square footage of the existing building has generally remained the same for over 75 years. In 2009 a new masonry split face block façade was completed to improve the building's appearance from 31st Street. Minor internal cosmetic improvements have been made over the last 11 years. The Owner's business is growing and in today's competitive market the value the Owner has placed on the proposed improvements is significant as several automotive services not currently offered to the public will now be offered by Murphy's Transmission and Auto, i.e., wheel alignment and truck service. The Subject Properties value would be substantially reduced if the variation was not granted for reasons stated above and in addition, the Owner's business would not be as competitive in today's automotive business. The Owner's investment will serve to stimulate further development in this area of the Village and meet the communities need for a modern transmission and complete auto repair.



APPLICATION FOR SITE PLAN REVIEW

ADDRESS OF SUBJECT PROPERTY: 1117 E. 31st Street, LaGrange Park

NAME OF APPLICANT(S): Michael Engel

INTEREST IN PROPERTY: Owner

ADDRESS: 1117 E. 31st Street

CITY, STATE, ZIP: LaGrange Park, Illinois 60526

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF PROPERTY OWNER/TRUSTEE(S): Michael Engel

ADDRESS: 2253 Stonehaven Drive

CITY, STATE, ZIP: Plainfield, Illinois 60586

EMAIL: _____ PHONE: _____ FAX: _____

Planner

NAME OF ATTORNEY (IF APPLICABLE): Allen L. Kracower & Associates, Inc.

ADDRESS: 900 North Shore Drive, Suite 205

CITY, STATE, ZIP: Lake Bluff, Illinois 60044

EMAIL: ldziurdzik@kracower.com PHONE: 847-604-9600 FAX: 847-604-9601

NAME OF ENGINEER (IF APPLICABLE): NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ARCHITECT (IF APPLICABLE): M.A.G. Architect & Code Consultant Inc.

ADDRESS: 208 W. Washington Street, Unit 806

CITY, STATE, ZIP: Chicago, Illinois 60606

EMAIL: magarch007@hotmail.com PHONE: 312-578-0475 FAX: 708-588-0107

VILLAGE PERSONNEL: Provide the following information for any officer or employee of the Village with an interest in the Owner, Applicant, Consultant or the Subject Property and the nature and extent of that interest.

NAME: NA

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NATURE/EXTENT OF INTEREST: _____



PERMANENT INDEX NUMBER OF SUBJECT PROPERTY (TAX ID NO.): 15-28-430-034, -035, -036, -037

CURRENT ZONING CLASSIFICATION: C-1 Commercial District

ADJACENT ZONING CLASSIFICATION:

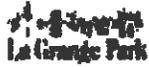
NORTH: S-1 Single Family Res. District SOUTH: C-1 Commercial District
 EAST: C-1 Commercial District WEST: C-1 Commercial District

REQUIRED DOCUMENTATION: All required documents must be submitted in hard copy (2 copies) and in digital form (1 copy).

- STATEMENT OF AGREEMENT TO REIMBURSE COSTS (separate document)
- PROOF OF OWNERSHIP (current title policy report or deed and current title search)
- LEGAL DESCRIPTION
- PLAT OF SURVEY (certified by registered land surveyor)
- SITE PLAN (see description below)
- LANDSCAPE PLAN

SITE PLAN: Submit with this application a Site Plan, certified by a registered architect or land surveyor, showing:

- Accurate lot lines and dimensions of the Subject Property, all principal and accessory structures currently located on or proposed to be constructed on the Subject Property.
 - Distances between structures and lot lines, distances between all principal and accessory structures.
 - A vehicular and pedestrian circulation plan showing the location, dimensions, gradient, and number of all vehicular and pedestrian circulation elements including rights-of-way and streets; driveway entrances, curbs, and curb cuts; number, location and total count of parking spaces (regular and handicapped) and loading spaces, circulation aisles; sidewalks, walkways, and pathways; total lot coverage of all circulation elements divided as between vehicular and pedestrian ways. Submit with the Site Plan a detailed Statement of Property Uses (listing all activities and uses which will occur on the Subject Property) together with a calculation of the number of parking and loading spaces required for all uses of the Subject Property.
 - Total open space and total impervious surface.
 - All existing and proposed surface and subsurface drainage and retention and detention facilities and all existing and proposed water, sewer, gas, electric, telephone, and cable communications lines and easements and all other utility facilities.
 - Location, size, and arrangement of all outdoor signs and lighting.
 - Location and height of fences or screen plantings and the type or kind of building materials or plantings to be used for fencing or screening.
 - A detailed landscaping plan showing location, size, and species of all trees, shrubs, and other plant material.
- Any other items specifically required by the Zoning Code or the ordinance approving a specific development.



STANDARDS FOR SITE PLAN REVIEW: In reviewing site plans, the relationship of the site plan to existing zoning regulations, conditions imposed upon the Subject Property by specific ordinance, adopted land use policies and the goals and objectives of the Comprehensive Plan shall be evaluated. In addition, the following characteristics shall also be evaluated.

1. Degree of conformity with existing standards.
2. Regulations of the Zoning Code and any other applicable regulations within the Village's Municipal Code, and the goals and policies of the Comprehensive Plan.
3. The location, arrangement, size, design and general site compatibility of buildings, light and signs, including:
 - a. Efficient use of land that responds to existing off-site utilities and service conditions in order to minimize the demand for additional municipal services, utilities and infrastructure.
 - b. Compatibility with, and mitigation of, any potential impact upon adjacent properties.
 - c. Site illumination designed and installed to minimize adverse impact on adjacent properties.
 - d. Signs which comply with Section 15 of the Zoning Code.
4. Landscaping and the arrangement of open space or natural features on the site should:
 - a. Create a desirable and functional environment for motorists, pedestrians, bicyclists and occupants of residential dwellings, business owners and employees. To achieve such an environment, landscaping may take advantage of open space design features such as bike paths, running paths and outdoor relaxation areas.
 - b. Preserve unique natural resources, including measures to preserve and protect existing healthy, mature trees.
 - c. Protect natural resources and landscaping on adjacent sites.
 - d. Design drainage facilities to promote the use and preservation of natural watercourses and patterns of drainage.
 - e. Utilize plant materials suitable to withstand the climatic conditions of the Village and microclimate of the site. The use of species native to northeastern Illinois is encouraged.
 - f. Use of screening to buffer the impact of the development on adjacent uses and enhance the appearance and image of the Village by screening incompatible uses and certain site elements, and creating a logical transition to adjoining lots and developments.
5. Circulation systems and off-street parking shall be designed to:
 - a. Provide adequate and safe access to the site for motor vehicles as well as alternate modes of transportation, including pedestrians and bicyclists.
 - b. Minimize potentially dangerous traffic movements.
 - c. Separate pedestrian and auto circulation and provide for bicycle parking or storage insofar as practical.
 - d. Minimize curb cuts by using cross-access easements and shared parking.
 - e. Design off-street parking lots or garages to minimize adverse impacts on adjacent properties, particularly through the use of perimeter and interior landscaping, promote logical and safe parking and internal circulation.
 - f. Clearly define pedestrian access from the parking area to the building(s). A clearly defined visible and identifiable network of pedestrian connections should be provided in and between parking lots, street sidewalks, open spaces and buildings.

OWNER/APPLICANT REPRESENTATIONS:

The Owner states that he and/or she consent to the filing of this application and that all information contained herein is true and correct to the best of his and/or her knowledge.

Name of Owner (print): MICHAEL ENGEL Date: 7-21-20
Signature of Owner: Michael Engel Date: 7-21-20

The applicant certifies that all of the information contained in this application is correct to the best of applicant's knowledge. The applicant understands that an incomplete or nonconforming application will not be considered. In addition, the applicant understands that the Village may require additional information prior to the consideration of this application.

Name of Applicant (print): MICHAEL ENGEL Date: 7-21-20
Signature of Applicant: Michael Engel Date: 7-21-20

APPLICATION FEE

An application fee of \$500.00, payable to the Village of La Grange Park, must accompany this Application.

REIMBURSEMENT OF FEES REQUIRED DEPOSIT AMOUNT

A deposit in the amount of \$1,000.00, payable to the Village of La Grange Park, must accompany this Application and the executed Reimbursement of Fees Agreement.

Revised July 2016

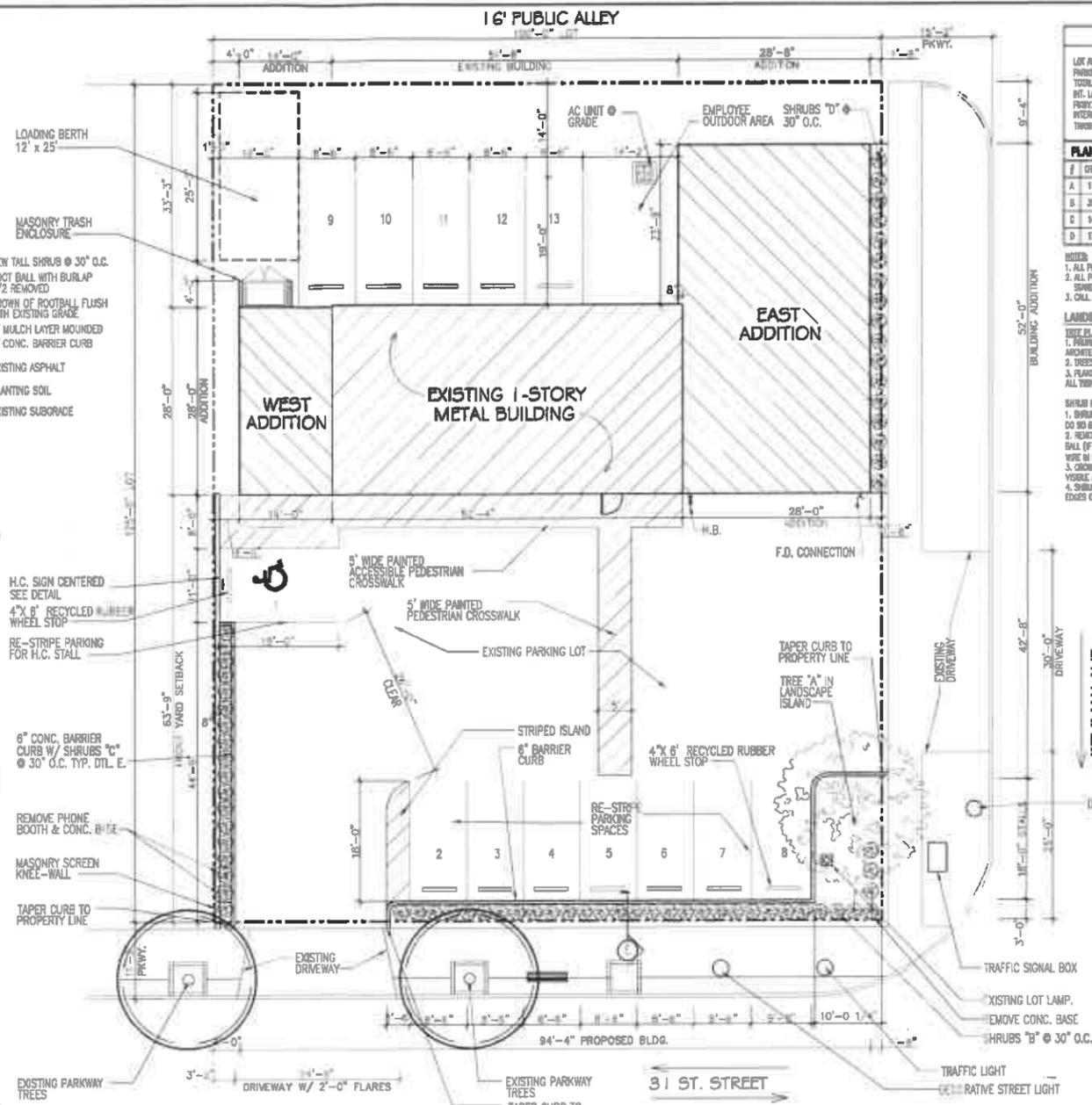
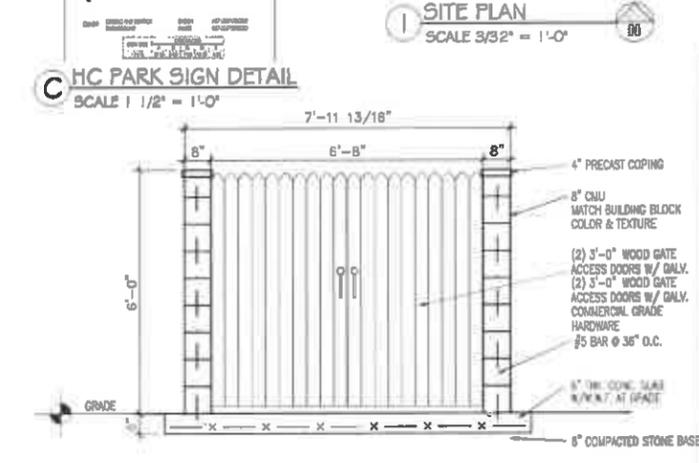
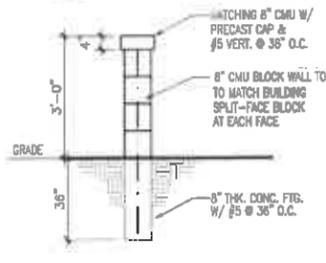
MURPHY'S AUTO REPAIR

1117 E. 31 ST STREET LAGRANGE PARK, ILLINOIS

General Notes:

- HOLD HARMLESS CLAUSE:** THE OWNER AND CONTRACTOR SHALL PURCHASE FROM AND MAINTAIN IN A COMPANY OR COMPANIES LIABILITY TO DO BUSINESS IN THE STATE OF ILLINOIS, AND WILL ADDITIONALLY INSURE AND HOLD HARMLESS THE ARCHITECT AND/OR ENGINEER OF RECORD FROM ANY AND ALL CLAIMS WHICH MAY ARISE OUT OF OR RESULT FROM THE CONTRACTOR'S OPERATION UNDER THE CONTRACT AND FOR WHICH THE CONTRACTOR OR BY A SUBCONTRACTOR OR BY ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM, OR BY ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE.
- WAIVER:** CONTRACTOR (AND ANY SUBCONTRACTOR INTO WHOSE SUBCONTRACT THIS CLAUSE IS INCORPORATED) AGREES TO ASSUME THE ENTIRE LIABILITY FOR ALL PERSONAL INJURY CLAIMS SUFFERED BY ITS OWN EMPLOYEES, INCLUDING WITHOUT LIMITATION CLAIMS UNDER THE ILLINOIS STRUCTURAL WORK ACT, ASSERTED BY PERSONS LEGALLY INJURED ON THE PROJECT, WAIVES ANY LIMITATION OF LIABILITY DEFENSE UPON THE WORKERS COMPENSATION ACT, COURT INTERPRETATIONS OF SAID ACT OR OTHERWISE, AND AGREES TO INDEMNIFY AND DEFEND OWNER AND DESIGN PROFESSIONAL AND THEIR AGENTS, EMPLOYEES AND CONSULTANTS FROM AND AGAINST ALL SUCH LOSSES, DAMAGES, DAMAGE OR INJURY INCLUDING REASONABLE ATTORNEY FEES THAT MAY BE SUSTAINED AS A RESULT OF SUCH CLAIMS, EXCEPT TO THE EXTENT THAT THE ILLINOIS LAW PROHIBITS INDEMNITY FOR THE INDEMNITIES OWN NEGLIGENCE.
- PERMITS AND FEES:** THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND FEES AND SHALL BE REIMBURSED BY THE OWNER.
- CODE REQUIREMENTS:** THE CONTRACTOR SHALL COMPLY WITH ALL ORDINANCES, LAWS, RULES, AND REGULATIONS AND SHALL BEAR THE COSTS ARISING FROM VIOLATIONS THEREOF. IF THE DRAWINGS AND/OR SPECIFICATIONS ARE AT VARIANCE THEREWITH, THE CONTRACTOR SHALL NOTIFY THE OWNER OF THE COST OF ANY NECESSARY CHANGES SHALL BE ALLEGATED.
- TEMPORARY SUPPORTS AND SHORING:** THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY SUPPORTS AND SHORING AND SHALL PROVIDE SAME BEFORE REMOVAL OF ANY EXISTING STRUCTURAL MEMBER.
- CONNECTION AND ADJACENT WORK:** THE CONTRACTOR SHALL REPAIR OR REPLACE TO MATCH AND TO MEMBER ALL EXISTING ADJACENT SURFACES INSTALLED BY OTHERS WHICH BECOME DAMAGED BY THE INSTALLATION OF SAID CONTRACTORS OR SUBCONTRACTORS WORK.
- GUARANTEE OF WORK:** THE CONTRACTOR SHALL BE DEEMED ANY OF HIS WORK THAT FAILS TO CONFORM TO THE CONTRACT, AND SHALL REMEDY ANY DEFECT DUE TO FAULTY MATERIAL OR WORKMANSHIP WHICH APPEARS WITHIN A PERIOD OF ONE YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION.
- INSURANCE:** THE CONTRACTOR SHALL NOT COMMENCE WORK UNTIL HE HAS OBTAINED ALL INSURANCE REQUIRED UNDER THIS PARAGRAPH AND UNTIL SUCH INSURANCE HAS BEEN APPROVED BY THE OWNER, NOR SHALL THE CONTRACTOR ALLOW ANY SUBCONTRACTOR TO COMMENCE WORK UNTIL SIMILAR INSURANCE HAS BEEN OBTAINED AND APPROVED. THE CONTRACTOR SHALL FURNISH THE OWNER WITH CERTIFICATES FROM A RELIABLE INSURANCE CARRIER. SAID POLICIES SHALL NOT BE CANCELED OR PERMITTED TO EXPIRE WITHOUT 10 DAYS ADVANCE NOTICE TO THE OWNER.
WORKMANS COMPENSATION AND EMPLOYERS GENERAL LIABILITY:
 WORKMANS COMPENSATION AND OCCUPATIONAL DISEASE INSURANCE AT THE STATUTORY LIMITS AS PROVIDED BY THE STATE OF ILLINOIS NOT LESS THAN 1,000,000 FOR ALL DAMAGES, COMPREHENSIVE GENERAL LIABILITY INSURANCE:
 BODILY INJURY LIABILITY:
 100,000 EACH PERSON / 300,000 EACH OCCURRENCE / 300,000 AGGREGATE PRODUCTS
 PROPERTY DAMAGE LIABILITY:
 50,000 EACH OCCURRENCE / 100,000 EACH OPERATION / 100,000 AGGREGATE INDEPENDENT CONTRACTORS PROTECTIVE AND COMPLETED OPERATIONS LIABILITY COMPREHENSIVE MOTOR VEHICLE LIABILITY INSURANCE COVERING ALL OWNED, HIRED, NON-OWNED VEHICLES INCLUDING LOADING AND UNLOADING THEREOF:
 BODILY INJURY LIABILITY:
 150,000 EACH PERSON / 300,000 EACH OCCURRENCE
 PROPERTY DAMAGE LIABILITY:
 50,000 EACH OCCURRENCE
- EXTRA WORK, CHANGES, AND PAYMENTS:** THE OWNER MAY ORDER CHANGES IN OR ADDITIONS TO THE WORK. THE CONTRACT SUM BEING ADJUSTED ACCORDINGLY. THE ADDITIONAL WORK SHALL BE PERFORMED BY THE CONTRACTOR AT A PRICE MUTUALLY AGREED UPON IN WRITING, BETWEEN THE PARTIES UNDER NO CIRCUMSTANCE SHALL ANY EXTRA WORK BE DONE WITHOUT THE PRIOR OF THE OWNER.
- MEASUREMENTS AND EXAMINATION OF PREMISES:** EACH CONTRACTOR SHALL VERIFY ALL MEASUREMENTS AT THE BUILDING AND SHALL BE RESPONSIBLE FOR SAME. NO ALLOWANCES SHALL BE MADE IN THE CONNECTION ON BEHALF OF ANY SUBCONTRACTOR FOR ANY ERROR OR NEGLIGENCE OF HIS PART, EXCEPT HIDDEN CONDITIONS INDETERMINABLE BEFORE COMMENCEMENT OF WORK.
- DEBRIS:** EACH CONTRACTOR SHALL REMOVE ALL DEBRIS FROM THE PROJECT AT THE END OF EACH DAY AND SHALL KEEP THE CONSTRUCTION SITE BROOM CLEAN AT ALL TIMES. IF THE OWNER IS FORCED TO HAVE THE AREA CLEANED, EACH CONTRACTOR SHALL BE BACKCHARGED. PARTICULAR CARE SHALL BE TAKEN TO PROTECT FROM DAMAGE AND TO KEEP ALL AREAS OF THE EXISTING WORK AREA CLEAN.
- LIENS:** THE CONTRACTOR SHALL FURNISH LIEN WAIVERS FOR ALL LABOR AND MATERIALS BEFORE FINAL PAYMENT IS MADE TOGETHER WITH AN AFFIDAVIT THAT THE RELEASES INCLUDE ALL LABOR AND MATERIALS FOR WHICH A LIEN MIGHT BE FILED.
- JOB CONDITIONS:** ALL CONTRACTORS TO VISIT PREMISES AND BECOME FAMILIAR WITH ALL OF THE WORK TO BE PERFORMED. NO EXTRA WORK ORDERS WILL BE ALLOWED FOR FAILURE TO BE INFORMED. ARCHITECT SHALL BE CONTACTED IF ANY DISCREPANCIES OR CONFLICTS ARE ENCOUNTERED.
- ALL CONTRACTORS, WORKMEN, MECHANICS, SUPPLIERS, INVITEES SHALL WORK IN HARMONY AND NOT INTERFERE WITH BUILDING OWNER AND BUILDING OWNERS AGENTS IN DOING WORK IN SAID PREMISES.**
- ALL ENTITIES PERFORMING WORK SHALL PROVIDE PROTECTION FOR EXISTING IMPROVEMENTS TO AN EXTENT THAT IS SATISFACTORY TO THE BUILDING OWNER AND SHALL ALLOW ACCESS TO THE PREMISES AT ALL TIMES DURING THE PERIOD WHEN CONSTRUCTION ACTIVITIES ARE UNDERTAKEN. DAMAGES SHALL BE PROMPTLY REPAIRED AT NOT ADDITIONAL COST TO THE OWNER.**
- ALL CONTRACTORS AND SUBCONTRACTORS SHALL USE ONLY THOSE SERVICE CORRIDORS AND SERVICE ENTRANCES DESIGNATED BY THE BUILDING OWNER FOR INGRESS AND EGRESS OF PERSONNEL AND DELIVERY AND REMOVAL OF EQUIPMENT, MATERIAL AND DEBRIS THROUGH OR ACROSS ANY COMMON AREAS SHALL ONLY BE PERMITTED WITH THE WRITTEN APPROVAL OF THE BUILDING OWNER DURING HOURS DETERMINED BY THE BUILDING OWNER.**
- BUILDING OWNER SHALL HAVE THE RIGHT TO ORDER ANY CONTRACTOR OR SUBCONTRACTOR WHO VIOLATES ANY SPECIFIED REQUIREMENTS HEREIN TO CEASE WORK AND TO REMOVE IT, ITS EQUIPMENT AND ITS EMPLOYEES FROM THE PREMISES.**
- EXISTING UTILITIES SHALL BE MAINTAINED, KEPT IN SERVICE, AND PROTECTED AGAINST DAMAGE DURING OPERATIONS UNLESS INDICATED OTHERWISE. DO NOT INTERRUPT EXISTING UTILITIES SERVING OCCUPIED OR USED FACILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES, AS ACCEPTABLE TO THE GOVERNING AUTHORITIES AND OWNER.**
- CONTRACTOR AND SUBCONTRACTORS SHALL IMMEDIATELY NOTIFY THE OWNER AND ARCHITECT OF ANY CHANGE OF THE AGREED UPON SCHEDULING OF OPERATIONS, METHODS OF OPERATIONS AND THE REMOVAL OF DEBRIS.**

DO NOT SCALE DRAWINGS.



ENERGY CONSERVATION CODE COMPLIANCE STATEMENT

I certify that I am a Registered Energy Professional (REP.) I also certify that to the best of my professional knowledge and belief that the attached plans for:

1117 E. 31st Street, LaGrange Park, IL.

Comply with the requirements of Chapter 18-13, Energy Conservation, of the State of Illinois, except 18-13-303:

MARCO A. BUTLER #52 001-018482
LICENSED ARCHITECT

5/grad Date: 05-15-2020
Illinois Lic. No. 001-013452 Exp. date: 11-30-2020

SCOPE OF WORK:	
EXPANSION OF MURPHY'S AUTO REPAIR FACILITY. WORK TO INCLUDE (2) MASONRY ADDITIONS: -1,064 SF EAST ADDITION WITH (2) TRUCK BAYS & EMPLOYEE LOUNGE AREA. -362 SF WEST EQUIPMENT BAY WITH TRIPLE BASIN. -ADDITIONS TO EXISTING PLUMBING & ELECTRICAL SYSTEMS, ALONG WITH NEW RTU FOR LOUNGE.	
BUILDING CODE INFORMATION	
OCCUPANCY CLASS:	AUTO REPAIR FACILITY
CONSTRUCTION:	MASONRY BUILDING
FIRE SUPPRESSION:	SPRINKLER EQUIPPED BUILDING
ZONE:	C-1 COMMERCIAL DISTRICT
LOT:	12,800 SF (107' x 120')
EXIST. BLDG.	1,476 SF (82'-4" x 28'-0")
PROPOSED BLDG.	3,330 SF (1,864' + 362 SF ADDITIONS)
PARKING:	18 STALLS (1 H.C. STALL)
DRAWING INDEX	
A-1	SITE PLAN & BLDG. INFORMATION
A-2	EXISTING FLOOR PLAN & GENERAL NOTES
A-3	PROPOSED FLOOR PLAN & SCHEDULES
A-4	BUILDING SECTION & TYPICAL WALL SECTION
A-5	BUILDING ELEVATIONS
P-1	PLUMBING DIAGRAMS & SCHEDULES
M-1	MECHANICAL FLOOR PLAN & SCHEDULES
E-1	ELECTRICAL FLOOR PLAN & NOTES

LANDSCAPING INFORMATION	
LOT AREA:	12,800 SF
PARKING SPACES REQ'D:	2 per WORK BAY 10 TOTAL
TOTAL VEHICULAR USE AREA:	4,376 SF
NET LANDSCAPING ACTUAL:	4,125 SF (SMALL ISLAND 14/28/18)
TREE REQ'D:	EXISTING
INTERIOR TREES ACTUAL:	1 ON 175.75 SF ISLAND
TREES COLLECTION ENCLD.:	6'-0" HIGH MASONRY ENCLOSURE

PLANT LIST			PLANTING DATE: JUNE 15, 2021	
#	QTY	SIZE	COMMON NAME	BOTANICAL NAME
A	1	3"	TRUMP TREE	LIPODORON TULIPIFERA
B	32	30"	SUMMER WINEBARK	PHYSCOPARUS OPULIFOLIUS
C	14	30"	PINK DIAMOND	HYDRANGEA PINKLATA
D	17	30"	PINK DIAMOND	HYDRANGEA PINKLATA

- NOTES:**
- ALL PLANTING BEDS TO HAVE 3" OF DOUBLE SPREADDED HORIZONAL MULCH.
 - ALL PLANTS WILL MEET THE HEIGHT ASSOCIATION OF MANSURION STANDARDS FOR PLANT MATERIAL.
 - CALL UTILITY TO LOCATE UTILITIES BEFORE PROCEEDING.

- LANDSCAPING NOTES:**
- SOIL PLANTING:**
- PLANT TREES AFTER INSTALLATION PER DIRECTION OF LANDSCAPE ARCHITECT.
 - TREES MAY REQUIRE STAKING OR CUPING AFTER PLANTING.
 - PLANT TREES SUCH THAT TOP OF ROOT BALL IS 3" ABOVE GRADE. REMOVE ALL TWIG, ROPE, WIRE, AND BURLAP FROM TOP HALF OF ROOT BALL.

- SHRUB PLANTING:**
- SHRUB (DO NOT PRUNE, STAKE, OR WRAP SHRUBS UNLESS ORDERED TO DO SO BY LANDSCAPE ARCHITECT).
 - REMOVE ALL TWIG, ROPE, WIRE AND BURLAP FROM TOP HALF OF ROOT BALL (IF PLANT IS SUPPLIED WITH A WIRE BASKET AROUND THE ROOT BALL, CUT WIRE IN FOUR PLACES AND FOLD DOWN 1" INTO PLANTING HOLES).
 - CROWN OF ROOTBALL FLUSH WITH EXISTING GRADE LEAVING BRINK FLARE VISIBLE AT THE TOP OF THE ROOT BALL.
 - SHRUBS SHALL BE THREE TIMES WIDER THAN DIAMETER OF ROOT BALL, EDGES OF PE TO BE ROUNDHEADED.

- APPLICABLE CODES:**
- INTERNATIONAL BLDG. CODE - 2015
 - INTERNATIONAL MECH. CODE - 2015
 - INTERN. CONSERVATION CODE - 2015
 - IL ENERGY CONSERV. CODE - 2018
 - NATIONAL ELECTRIC CODE - 2014
 - IL PLUMBING CODE - 2017
 - IL ACCESSIBILITY CODE - 2018
 - INTERN. FIRE CODE - 2015
 - LIFE SAFETY CODE NFPA - 2015
 - NATIONAL FIRE CODE - 2014

THIS IS TO CERTIFY THAT THESE PLANS WERE PREPARED UNDER THE DIRECT SUPERVISION OF THE UNDERSIGNED AND TO THE BEST OF HIS KNOWLEDGE AND BELIEF CONFORM TO THE REQUIREMENTS OF THE BUILDING CODES AND THE ACCESSIBILITY STANDARDS OF THE STATE OF ILLINOIS.

MY CERTIFICATION EXPIRES:
11-30-20

MARCO A. BUTLER #52 001-018482
LICENSED ARCHITECT

DISCLAIMER:

THE PROJECT ARCHITECT OR ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ACTION TAKEN BY ANY PERSON ON THE PROJECT IF THEY PURSUE ANY OVERSIGHT OF ANY DISCREPANCY, ERROR, OMISSION, OR AMBIGUITY IN THE CALCULATIONS, SPECIFICATIONS, AND OR SPECIFICATIONS UNLESS THE PROJECT ARCHITECT OR ENGINEER HAS BEEN NOTIFIED, AND HAS CORRECTED, SINCE THE INCLUSION OF HAS MORE CLEARLY EXPLORED THE INTENT OF THE DRAWING CALCULATIONS AND/OR SPECIFICATIONS.

MURPHY'S AUTO REPAIR
1117 E. 31ST STREET
LAGRANGE PARK, ILLINOIS

SITE PLAN & GENERAL NOTES

M. A. G.
ARCHITECT & CODE CONSULTANT INC.
208 W. WASHINGTON STREET
UNIT 808
CHICAGO, ILLINOIS 60606
VOICE: 312-678-0478 FAX: 708-588-0107

DATE: 8-16-20
REVISED MG 7-15-20
VILL REV 8-3-20
SITE PLAN REV 8-7-20

DRAWN BY: AM
JOB NO.

SHEET NO.
A-1
SHEET 1 OF 2

DEMOLITION NOTES

1. BEFORE DEMOLITION CONTRACTOR MUST BE AWARE OF ANY UNDERGROUND FACILITIES & NOT TO DISTURB THEM.
2. PRIOR TO ANY DEMOLITION WORK EACH CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSPECTION OF THE PREMISES, VERIFYING ALL CONDITIONS AND DIMENSIONS FOR ACCURACY AND FEASIBILITY AND MAKE ADJUSTMENTS FOR SAME.
3. PRIOR TO DEMOLITIONS OF ANY WALLS, FLOORS AND / OR ROOFS, THE CONTRACTOR SHALL VERIFY EXISTING STRUCTURAL CONDITIONS AND ALL BEARING WALLS AND CONSULT THE ARCHITECT AS TO STRUCTURAL CONDITIONS THAT MAY BE CONTRARY TO THESE NOTES.
4. ALL DEMOLITION SHALL BE DONE IN ACCORDANCE WITH THE CITY OF CHICAGO BUILDING CODE.
5. PROPERLY SHORE EXISTING STRUCTURE WHEN REMOVING ANY WALLS, FLOORS AND ROOF INDICATED ON PLAN.
6. CONDUCT DEMOLITION OPERATIONS AND THE REMOVAL OF DEBRIS TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS AND OTHER ADJACENT OCCUPIED OR UNOCCUPIED AREAS.
7. CONTRACTOR (S) SHALL TRANSPORT MATERIALS REMOVED FROM THE DEMOLISHED STRUCTURES AND PROPERLY DISPOSE OF SAID MATERIALS LEGALLY OFF SITE/PREMISES.

DESIGN CRITERIA:

1. LATEST EDITION OF CHICAGO BUILDING CODE.
2. DESIGN LOADS:

ROOF SYSTEM:

LINE LOAD ROOFS 30 DEGREES OR LESS: 25 PSF
HEAD LOAD: 40 PSF

LINE LOAD ROOFS SHOW LOAD (FLAT ROOFS): 55 PSF
LINE LOAD: 55 PSF

FLOOR LOADS:

LINE LOAD: 40 PSF
DEAD LOAD: 15 PSF
TOTAL LOAD: 55 PSF

3. WIND LOAD: EXPOSURE C. BASIC WIND SPEED: 90 MPH.

4. STANDARDS: TIMBER CONSTRUCTION (LATEST EDITION), "NATIONAL INSTITUTE OF TIMBER CONSTRUCTION" (LATEST EDITION), "NATIONAL DESIGN SPECIFICATIONS FOR WOOD CONSTRUCTION" (LATEST EDITION), "NATIONAL FOREST PRODUCTS ASSOCIATION (LATEST EDITION).

5. USE GRADED LUMBER WITH ALLOWABLE STRESS EQUAL TO WHAT IS LISTED FOR ALL WOOD MEMBERS UNLESS OTHERWISE NOTED OR SHOWN.

SITE WORK NOTES:

CONTRACTOR TO CONTACT D.G.E.A. PRIOR TO EXCAVATION AT (312) 744-7000

1. THE CONTRACTOR SHALL CAREFULLY AND FULLY EXAMINE THE SITE OF THE WORK AND COMPARE IT TO THIS DOCUMENT AND ALL OTHER CONDITIONS AND LIMITATIONS PERTAINING TO THE WORK.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATIONS AND MAINTENANCE OF ADEQUATE SIGNS, BARRICADES AND WARNING DEVICES TO INFORM AND PROTECT THE PUBLIC THE COST OF FURNISHING AND MAINTAINING SIGNS, BARRICADES AND WARNING DEVICES SHALL BE INCIDENTAL TO THE CONTRACT AND NO ADDITIONAL COMPENSATION WILL BE ALLOWED.

3. LOCATE EXISTING UNDERGROUND UTILITIES IN AREAS OF WORK. IF UTILITIES ARE TO REMAIN IN PLACE, PROVIDE ADEQUATE MEANS OF SUPPORT AND PROTECTION DURING EXCAVATION OPERATIONS. SHALL BE EXCAVATED OR INADEQUATELY CHANGED UTILITIES BE EXCAVATED DURING EXCAVATIONS. CONSULT UTILITY OWNER IMMEDIATELY FOR DIRECTION. EXISTING UTILITIES ARE TO REMAIN IN OPERATION DURING OPERATIONS.

LUMBER NOTES

1. ALL WOOD CONSTRUCTION SHALL CONFORM TO THE AIA (AMERICAN INSTITUTE OF TIMBER CONSTRUCTION) AND THE APA (AMERICAN PLYWOOD ASSOCIATION) NATIONAL DESIGN SPECIFICATIONS.

2. ALL WOOD FRAMING LUMBER SHALL BE SOUTHERN PINE, STRUCTURAL DRESSED GRADE #2 WITH FIBER 1,400 PSI AND E=1,800,000 PSI CONTAINING A MOISTURE CONTENT NOT GREATER THAN 19%.

3. MEMBERS AND BRIMS FORMED OF TWO OR MORE MEMBERS SHALL BE ADEQUATELY FASTENED TOGETHER THROUGHOUT THEIR LENGTH AND EACH MEMBER SHALL BE FULL LENGTH.

4. ALL WALL BRACING SHALL BE APPLIED AS FOLLOWS: A. CENTER VERTICAL JOINTS OVER STUDS AND CENTER HORIZONTAL JOINTS OVER 2" BLOCKING OR PLATE. B. NAIL TOP OF PANELS TO DOUBLE TOP PLATE AND NAIL BOTTOM OF PANELS TO ANCHORED SILL PLATE. C. NAIL AND PLYWOOD BRACING AT ALL CORNERS OF LOT IN 1" X 4" FOR WALL BRACING. D. APPLY GYPSUM BOARD TO THE END JOINTS OF ADJACENT COURSES DO NOT OCCUR OVER THE SAME STUD.

5. ADEQUATE SHORING & BRACING DURING CONSTRUCTION SHALL BE PROVIDED TO RESIST WIND AND CONSTRUCTION LOADS.

6. NO UTILITY GRADE LUMBER IS PERMITTED. EACH PIECE OF LUMBER SHALL BE GRADE MARKED. LUMBER IN CONTACT WITH CONCRETE, MASONRY OR MOISTURE SHALL BE PROPERLY TREATED. WOOD SILL RESTING ON FOUNDATION SHALL BE OF TREATED LUMBER. UTILITY GRADE MAY BE USED FOR BLOCKING.

7. INTERIOR STAIRS SHALL BE ENGINEERED AND PRE-FABRICATED ON FIELD BUILT IN ACCORDANCE WITH THE CHICAGO BUILDING CODE. USE PAINT GRADE LUMBER FOR ALL EXPOSED TO VIEW SURFACES. ALL JOISTS, CHECKS, AND KNOTS TO BE FILLED, Sanded and READY FOR FINISH. ALL JOINTS TO BE GILLED AND SCREWED WITH A MINIMUM GILL OF 1/4".

8. PROVIDE FIRESTOPS IN STUD WALLS AND FLOORS AND CEILING FRAMINGS AND AS REQUIRED BY CODE.

9. PLYWOOD SHALL BE IDENTIFIED BY AN APPROVED AGENCY AS HAVING BEEN MANUFACTURED IN ACCORDANCE WITH U.S. PRODUCT STANDARD PS-1-58 AND SHALL BE EXTERIOR TYPE.

10. MINIMUM FLOOR LIVE, DEAD AND PARTITION LOADS SHALL BE EQUAL, NOT LESS: 65 PSF OR CODE, WHICHEVER IS MORE STRINGENT.

11. WOOD JOISTS AND STUDS ARE TO BE STRUCTURAL GRADE AND TO HAVE AN "SP" OF 1800 PSI AND AN "E" OF 1,800,000 PSI.

12. MATERIALS SPECIFIED ON THE DRAWINGS SHALL BE USED. ALL SUBSTITUTION OF MATERIAL SHALL NOT ALLOWED WITHOUT THE WRITTEN CONSENT OF THE ARCHITECT.

13. ALL EXPOSED TIMBER MEMBERS SHALL BE PRESSURE TREATED (KOLMANNIZED) WITH MINIMUM FIBER 2,000 PSI AND E=1,800,000.

14. ALL EXPOSED FIBERGLASS WALLS, SILL PLATES, AND STEEL CONNECTIONS OR PLATES SHALL BE HOT DIPPED GALVANIZED.

15. TIMBER FRAMING SHALL CONSIST OF NATURAL PRODUCTS OF MAX WIDE SECTIONS. THE LATER AS MANUFACTURED BY THE BEST CORPORATION.

16. TOP PLATES SHALL BE DOUBLED ON ALL STUD WALLS.

17. CRIPPLES UNDER MEMBERS SHALL BE CONTINUOUS TO THE SOLE PLATE.

18. BELOW ALL STUD WALLS AS REQUIRED FOR SHADING.

19. BLOCKING 2" WIDE OF EQUAL DEPTH OF THE MEMBERS SHALL BE PROVIDED BETWEEN ALL JOISTS AND BRIMERS AT THEIR SUPPORTS, UNLESS MEMBERS ARE NAILED TO A NEW JOIST.

20. INSTALL ALL HORIZONTAL MEMBERS WITH CROWN UP.

21. ALL MEMBERS IN BEARING SHALL BE ACCURATELY CUT AND ALIGNED SO THAT FULL BEARING IS PROVIDED WITHOUT THE USE OF SHIMS.

INSULATION NOTES

1. ALL NEW EXTERIOR WALLS, INTERIOR WALLS AND NEW INTERIOR SPACES SHALL BE INSULATED, RECOMMENDATIONS:

2. INSULATE ALL CEILING UNDER UNGRADED SPACES.

3. INSULATE ALL EXPOSED WATER LINES.

4. CONTRACTOR SHALL USE GREEN-CORNING OR JOHNS-MANVILLE OR EQUAL.

5. ALL JOINT INSULATION SHALL BE TIGHT BACKED.

6. FIBERGLASS BATT SHALL BE STAPLED INTO PLACE AND OTHERWISE INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS.

7. ALL EXTERIOR OPENINGS SHALL BE SEALED WITH AN EXPANDING LIQUID SEALANT. THESE OPENINGS SHALL INCLUDE BUT NOT LIMITED TO DOORS, WINDOWS AND ELECTRICAL OUTLETS.

8. FINISH AND INSTALL 1/2" THICK FIBERGLASS INSULATION OR EQUAL. PIPE WIND INSULATION ON ALL WATER SUPPLY LINES. INSULATION SHALL BE SLIP-FORM OR TAPED TO ASSURE INSULATION'S ADHERENCE TO PIPE.

FINISH CARPENTRY:

1. ALL EXISTING AND NEW EXTERIOR DOORS AND WINDOWS SHALL BE PROPERLY WEATHERSTRIPPED AND CHALKED WITH AN APPROVED NON-WATERING FINISHABLE CHALK.

2. NEW TRIM TO MATCH EXISTING IN TYPE, STYLE AND FINISH. TRIM THAT CANNOT BE MATCHED EXACTLY SHALL BE REPLACED WITH ONE THAT IS CLOSE IN SIMILARITY TO EXISTING AND WITH THE APPROVAL OF OWNER.

ROUGH CARPENTRY:

1. SAWN LUMBER WEATHER SHALL BE AS FOLLOWS:

A. SAWN LUMBER CALCULATIONS ARE BASED ON DOUGLAS FIR-LARCH EXCEPT AS SHOWN OTHERWISE ON THE DRAWINGS, GRADED IN ACCORDANCE WITH STANDARD GRADING RULES OF 1989 OR RULE #18 OF N.C.C.R. AS FOLLOWS:

1. LIGHT FRAMING - NO. 2 AND BETTER

2. STUDS - NO. 1 AND BETTER (LIGHT FRAMING)

3. JOISTS AND PLANKS - NO. 1 AND BETTER

4. BEAMS AND STRINGERS - DENGE NO. 1 AND BETTER

5. POSTS AND TIMBERS - DENGE NO. 1 AND BETTER

B. ALL 2" LUMBER SHALL BE SEASONED TO 19% MAXIMUM MOISTURE CONTENT.

C. ALL WOOD IN CONTACT WITH CONCRETE, MASONRY OR SOIL SHALL BE PRESSURE TREATED.

DRYWALL NOTES

1. DRYWALL WORK SHALL BE USED OR EQUAL AND SHALL INCLUDE ALL GYPSUM BOARD, CORNER BEAD, T-BEAD, JOINT COMPOUND, TAPING, DRYWALL COMPOUND AND ALL NECESSARY MATERIAL NEEDED TO COMPLETE THE DRYWALL WORK IN THE PROJECT.
2. ALL GYPSUM DRYWALL SURFACES TO BE REPEATED, FLATED, Sanded SMOOTH AND SOLID PRIMED AND READY FOR PAINT.
3. ALL GYPSUM DRYWALL IN BATHROOMS TO BE WATERPROOF TYPE AND TAPED AND FINISHED TO PREVENT WATER PENETRATION.

MASONRY NOTES

1. MORTAR TO BE TYPE M OR S AND JOINTS ARE TO BE TOOLED CONCAVE.
2. BRICK VENEER ANCHORS TO BE PLACED EVERY 3RD COURSE VERTICALLY, 2'-0" O.C.
3. PROVIDE FABRIC FLASHING OVER EXTERIOR STILET LINTLS WITH KEEP HOLES AT 2" - 0" ON CENTER WITH COTTON ROPE WOOL.
4. COLD WEATHER INSTALLATION: WHEN AIR TEMPERATURE IS BELOW 40 DEGREES F., BUT ABOVE 25 DEGREES F., SAND AND MIXING WATER SHALL BE PRE-HEATED TO A MINIMUM OF 70 DEGREES F., AND MAXIMUM OF 180 DEGREES F.
5. KEEP ALL BRICK CLEAN FROM MORTAR.
6. SET ALL UNITS, BOTH BOTTOM AND ENDS, IN FULL BED OF MORTAR WITH JOINTS UNIFORM IN THICKNESS.
7. CLEAN BRICK OF ALL EXCESS MORTAR UPON COMPLETION OF INSTALLATION. NO KICK SHALL BE USED UNLESS APPROVED BY THE ARCHITECT.

CONCRETE NOTES

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE "AMERICAN CONCRETE INSTITUTE BUILDING CODE" (ACI 318) AND WITH "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDING" (ACI 308), LATEST EDITIONS.
2. NO ADJUSTMENTS ARE PERMITTED IN THE CONCRETE, EXCEPT FOR AIR-ENTAINED CONCRETE OR COLD WEATHER ADJUSTERS, AND IN NO EVENT SHALL THE TOTAL VOLUME OF ADJUSTERS BE MORE THAN 2% OF THE TOTAL MIX.
3. PROTECT CONCRETE WORK FROM PHYSICAL DAMAGE OR REDUCED STRENGTH WHICH COULD BE CAUSED BY FROST, FREEZING ACTIONS, OR LOW TEMPERATURES, IN COMPLIANCE WITH ACI 308.
4. NO CALCIUM CHLORIDE AND/OR ANTIMONY CONTAINING CALCIUM CHLORIDE SHALL BE USED IN CONCRETE.
5. UNLESS NOTED OTHERWISE, ALL CONCRETE WORK SHALL CONTAIN MINIMUM REINFORCEMENT AS REQUIRED BY ACI 318-77.
6. GENERAL CONTRACTOR SHALL CHECK WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL DRAWINGS AND CONTRACTORS FOR OPENINGS, BUSHES, ANCHORS, HANGERS, INSERTS, SUE DEPRESSIONS AND OTHER ITEMS RELATING TO THE CONCRETE WORK, AND SHALL ASSUME FULL RESPONSIBILITY FOR THEIR PROPER LOCATION BEFORE PLACING CONCRETE. FRESH CONCRETE SHALL BE REQUIRED TO ALL FLOOR DRAINS.
7. NO STRUCTURAL CONCRETE SHALL BE POURED UNTIL THE CONCRETE DESIGN MIXES.
8. CONCRETE SHALL BE REGULAR VIBRATED, CONFORM TO ASTM C94, AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS.
9. CONCRETE CONSTRUCTION SHALL CONFORM TO "SPECIFICATION FOR STRUCTURAL CONCRETE FOR BUILDINGS" (ACI 308). a. CONCRETE SHALL HAVE MINIMUM 28 DAYS FIELD CURED COMPRESSIVE STRENGTH OF 3000 PSI. b. AIR ENTRAINMENT CONCRETE (5% + 1% AIR) SHALL BE USED FOR ALL CONCRETE EXPOSED IN THE FINISH WORK WHEN FREEZING TEMPERATURES MIGHT APPLY. c. ADJUSTERS CONTAINING CHLORIDE SALTS SHALL NOT BE USED.
10. CONCRETE SHALL BE OF "READY-MIXED CONCRETE" AND SHALL CONFORM TO ASTM C94. CONCRETE SHALL BE CONVEYED AND DEPOSITED IN ACCORDANCE WITH THE RECOMMENDATIONS OF ACI 318. d. 4" MAX. OF PLACEMENT. CONCRETE SHALL HAVE A SLUMP OF 4" MAXIMUM (PER ASTM C143) e. ALL CONCRETE SHALL BE THOROUGHLY CONSOLIDATED DURING PLACEMENT, USING A MECHANICAL VIBRATOR.
11. CONCRETE WHEN PLACED, SHALL HAVE A TEMPERATURE BETWEEN 50 DEGREES F. AND 70 DEGREES F. THE TEMPERATURE OF CONCRETE DURING MIXING OR TRANSPORTATION SHALL NEVER BE LOWER THAN 40 DEGREES F. NOR HIGHER THAN 90 DEGREES F.
12. DURING COLD WEATHER (AMBIENT TEMPERATURE BELOW 40 DEGREES F.) THE CONCRETE CONTRACTOR SHALL MAINTAIN THE CONCRETE AT A MINIMUM TEMPERATURE OF 50 DEGREES F. FOR 3 DAYS AND ABOVE 40 DEGREES F. FOR 14 DAYS FOLLOWING ITS PLACEMENT UNLESS OTHERWISE NOTED ON THE DRAWINGS.
13. DURING HOT WEATHER (AMBIENT TEMPERATURE ABOVE 80 DEGREES F.) THE CONCRETE CONTRACTOR SHALL FOLLOW THE RECOMMENDATIONS FOR HOT WEATHER CONCRETING AS DESCRIBED IN ACI 308 AS REQUIRED TO MAINTAIN TEMPERATURE AND SHRINKAGE CRACKING OF THE CONCRETE. (NO CONCRETE SHALL BE POURED IN EXCAVATION CONTAINING WATER OR ON FROZEN GROUND).
14. FOOTINGS:
15. FOOTINGS MAY BE POURED NEAR ADJACENT SIDES OF EXCAVATIONS ONLY IF APPROVED BY THE ARCHITECT.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPORT OF ALL TEMPORARY EXCAVATIONS AND EXCAVATIONS.
17. FOOTINGS ARE SIZED FOR A MINIMUM TOTAL LOAD BEARING PRESSURE OF 3,000 PSF.
18. FOOTINGS SHALL AT LEAST BE PLACED AT A MINIMUM DEPTH TO CONFORM TO LOCAL CODES, HOWEVER 3'-0" BELOW FINISH GRADE.
19. THE FINAL 3" OF EXCAVATION SHALL BE REMOVED BY HAND TOOL OPERATIONS IN ORDER TO ASSURE UNDISTURBED BEARING SURFACES.
20. FOOTINGS SHALL BE FOUNDED OF FIRM, UNDISTURBED, NATIVE, FREE-DRAINING SOILS. CONDITIONS FOUND TO BE OTHERWISE SHALL BE REPORTED TO THE ARCHITECT.
21. THE BOTTOM SURFACE OF FOOTINGS SHALL NOT SLOPE MORE THAN 1:0 VERTICAL TO 1:0 HORIZONTAL, EXCEPT AS SHOWN ON THE DRAWINGS.
22. NO EXCAVATION SHALL BE MADE LOWER AND CLOSER TO ANY FOOTING THAN 1:0 VERTICAL TO 3:0 HORIZONTAL, EXCEPT AS SHOWN ON THE DRAWINGS.
23. ALL GROUND OVER WHICH FOOTINGS AND SLAB-ON-GRADE ARE TO BE PLACED SHALL BE FREE OF EXPOSURE OR COMPRESSIBLE DEBRIS AND ORGANIC MATERIAL.
24. NO FOOTING AND SLAB-ON-GRADE CONCRETE SHALL BE PLACED ON MUDDY OR FROZEN GROUND. SLAB-ON-GRADE FOR SLAB-ON-GRADE SHALL BE DAMP AT TIME OF CONCRETE PLACEMENT.
25. BACKFILL:
26. BACKFILL SHALL BE PLACED IN 8 INCH MAXIMUM LIFTS AND COMPACTED TO A MINIMUM DENSITY OF 95% (UNDER SLAB-ON-GRADE) AND 90% (ELSEWHERE) OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM STANDARD T99.
27. BACKFILL SHALL CONSIST OF NON-EXPANSIVE, FREE-DRAINING, PREVIOUSLY GRANULAR MATERIAL, FREE OF DEBRIS AND ORGANIC MATERIAL.
28. SPLICES:
29. REINFORCEMENTS IN CONCRETE AND MASONRY SHALL HAVE LAP LENGTHS AS FOLLOWS:

BAR SIZE LENGTH IN CONCRETE LENGTH IN MASONRY

#3 1'-0" 2'-0"

#4 2'-0" 2'-0"

#5 2'-0" 3'-0"

#6 3'-0" 3'-0"

1. WELDED WIRE FABRIC SHALL BE LAPPED ONE GRID WIDTH PLUS 2".

2. REINFORCEMENT SHALL BE BENT OVER.

3. REINFORCEMENT SHALL NOT BE WELDED.

10. PLACING:

1. REINFORCEMENT SHALL BE ACCURATELY PLACED AND ADEQUATELY SUPPORTED BY CONCRETE NETS OR OTHER APPROVED CHAIRS, SPACERS OR TIES AND SECURED AGAINST DISPLACEMENT DURING CONCRETE OR GROUT PLACEMENT. TACK WELDING SHALL NOT BE ALLOWED.

2. EXCEPT WHERE SHOWN OTHERWISE ON THE ARCHITECTURAL DRAWINGS, REINFORCEMENT IN CONCRETE SHALL HAVE CONCRETE COVER AS FOLLOWS:

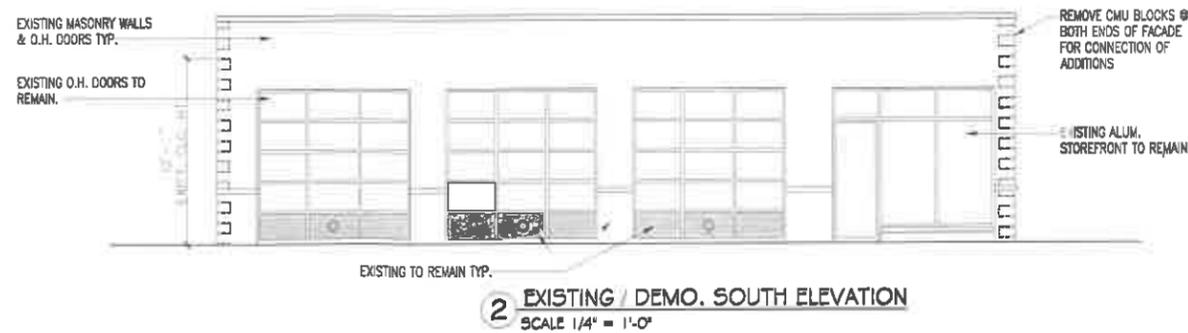
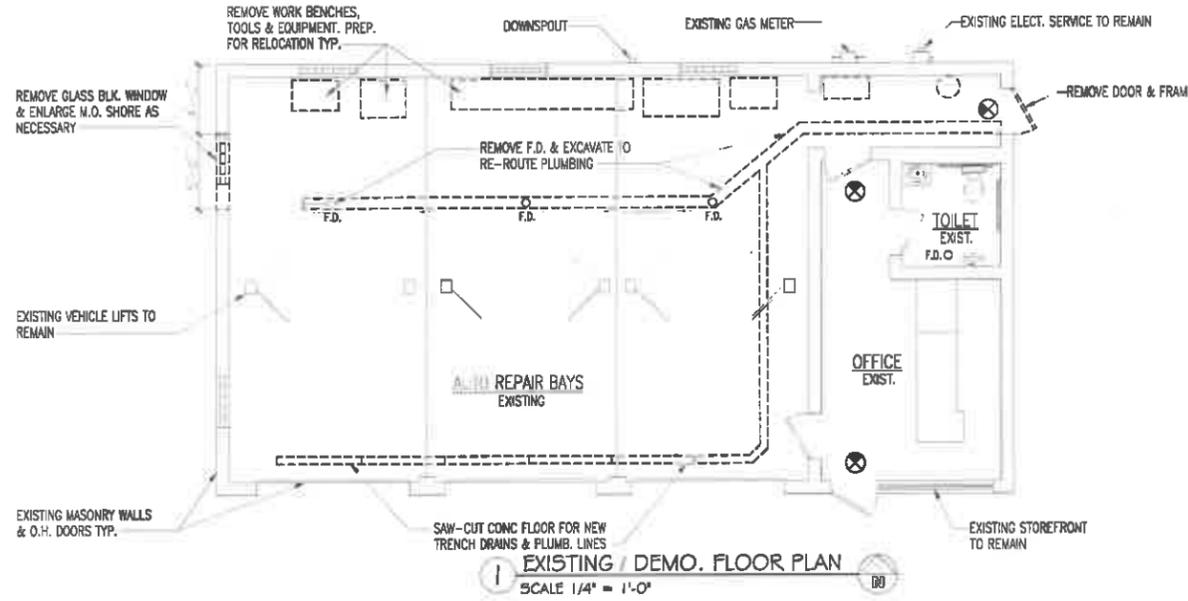
1. CONCRETE DEPOSITED AGAINST EARTH..... 3"

2. FORMED CONCRETE AGAINST EARTH..... 2"

3. EXTERIOR FACES OF WALLS..... 2"

4. INTERIOR FACES OF WALLS..... 3/4"

5. TO TOP OF SLAB-ON-GRADE..... 3/4"



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MURPHY'S AUTO REPAIR
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EXISTING / DEMO. FLOOR PLAN & NOTES



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DATE:
5-15-20

SHEET NO.
A-2
DRAWN BY: AM
JOB NO. SHEET 2 OF 2

WALL / PARTITION TYPES

EXISTING WALLS & INTERIOR PARTITIONS TO REMAIN. PATCH AND REFINISH IF DAMAGED DURING CONSTRUCTION.

EXISTING WALLS / PARTITIONS TO BE REMOVED. SHORE & BRACE EXISTING STRUCTURE AS REQUIRED.

EXTERIOR MASONRY WALLS:
 - 8" CMU WALLS W/ #5 @ 24" O.C. GROUTED SOLID
 3 HR. FIRE RATED PER UL DESIGN NO. U904.

INSULATED MASONRY EXT. WALLS:
 - 8" CMU PERIMETER WALLS W/ #5 @ 24" O.C. GROUTED SOLID.
 - 1" RIGID INSULATION (R-6) CONTINUOUS
 - 3/8" MTL. STUDS @ 16" O.C.
 - 3" F.G. BATT INSULATION (R-15)
 - 5/8" GYP. BD. FINISHED @ INTERIOR SIDE TYPICAL.
 3 HR. FIRE RATED PER UL DESIGN NO. U904.

NEW PARTITIONS:
 - 3/8" MTL. STUDS @ 16" O.C. (18 GA. @ 12" O.C. @ BRG. WALL.)
 - 5/8" GYP. BD. FINISHED @ BOTH SIDES TYPICAL.
 1 HR. FIRE RATED PER UL DESIGN NO. U423
 NOTE: USE MOISTURE RESISTANT GYP. BD. AT ALL PLUMBING / WET WALL LOCATIONS.

INSULATED INTERIOR PARTITIONS:
 - 3/8" MTL. STUDS @ 16" O.C.
 - 3" F.G. BATT INSULATION (R-15)
 - 1" RIGID INSULATION (R-6) ON 1 SIDE.
 - 5/8" GYP. BD. FINISHED ON BOTH SIDES TYPICAL.
 1 HR. FIRE RATED PER UL DESIGN NO. U423

NOTES: * ALL WALL AND CEILING FINISHES TO MEET A CLASS 2 FLAME SPREAD RATING OF 25-75 AND 400 SMOKE DEVELOPED.
 - INSTALL NEW 3/8" GYP. BD. CEILING WITH R-40 BATT INSULATION ABOVE, THROUGHOUT EMPLOYEE SPACES.
 - APPLY CMU WATER SEALER TO ALL NEW MASONRY WALLS ON EXTERIOR FACE PER MANUFACTURER'S SPECIFICATIONS.

DOOR SCHEDULES

TAG	SIZE	TYPE	HW/WR	REMARKS
1	3'-0" x 6'-8" x 1 3/4"	MTL.	LOCK-SET & CLOSER & THRESHOLD	INSULATED MTL DR. W/ VISION PANEL. U=0.30
2	3'-0" x 6'-8" x 1 3/4"	MTL.	LOCK-SET & CLOSER	INSULATED MTL DR. W/ VISION PANEL. U=0.30
3	3'-0" x 6'-8" x 1 3/4"	MTL.	PRIVACY LOCK & CLOSER	INSULATED MTL DR., U=0.30
4	10'-0" x 10'-0" x 1"	ALUM.	STEEL TRACK SET & OPENER	OVERHEAD DR. W/ GLAZED & INSUL. PANELS
5	10'-0" x 12'-0" x 1"	ALUM.	STEEL TRACK SET & ELECT. OPENER	OVERHEAD DR. W/ GLAZED & INSUL. PANELS
6	3'-0" x 6'-8" x 1 3/4"	MTL.	LOCK-SET & CLOSER	INSULATED MTL DR. W/ KNOBBED KNOB

NOTES: * ALL DOOR HW/WR IS TO BE LEVER TYPE AND TO PROVIDE FOR KEYLESS EGRESS.
 * ALL GLAZED DOORS TO BE OF TEMPERED GLASS.
 * ALL DOORS TO OPERATE @ MAX. 5 LBS PUSH/PULL FORCE (8.5 LBS. FOR EXTERIOR DOORS)
 * MECH. & ELECT. ROOM DOORS TO HAVE KNOBBED KNOBS.

WINDOW SCHEDULE

TAG	SIZE	TYPE	MAKE / MODEL	REMARKS
A	2'-0" x 4'-0"	ALUM.	HARVEY OR EQUAL	FIXED ALUM. WINDOWS U=0.30 & SHGC = 0.45 QTY. 5

NOTE: INSTALL BRONZE ALUMINUM ANODIZED WINDOWS PER MANUFACTURER'S SPECIFICATIONS.

LINTLE SCHEDULES

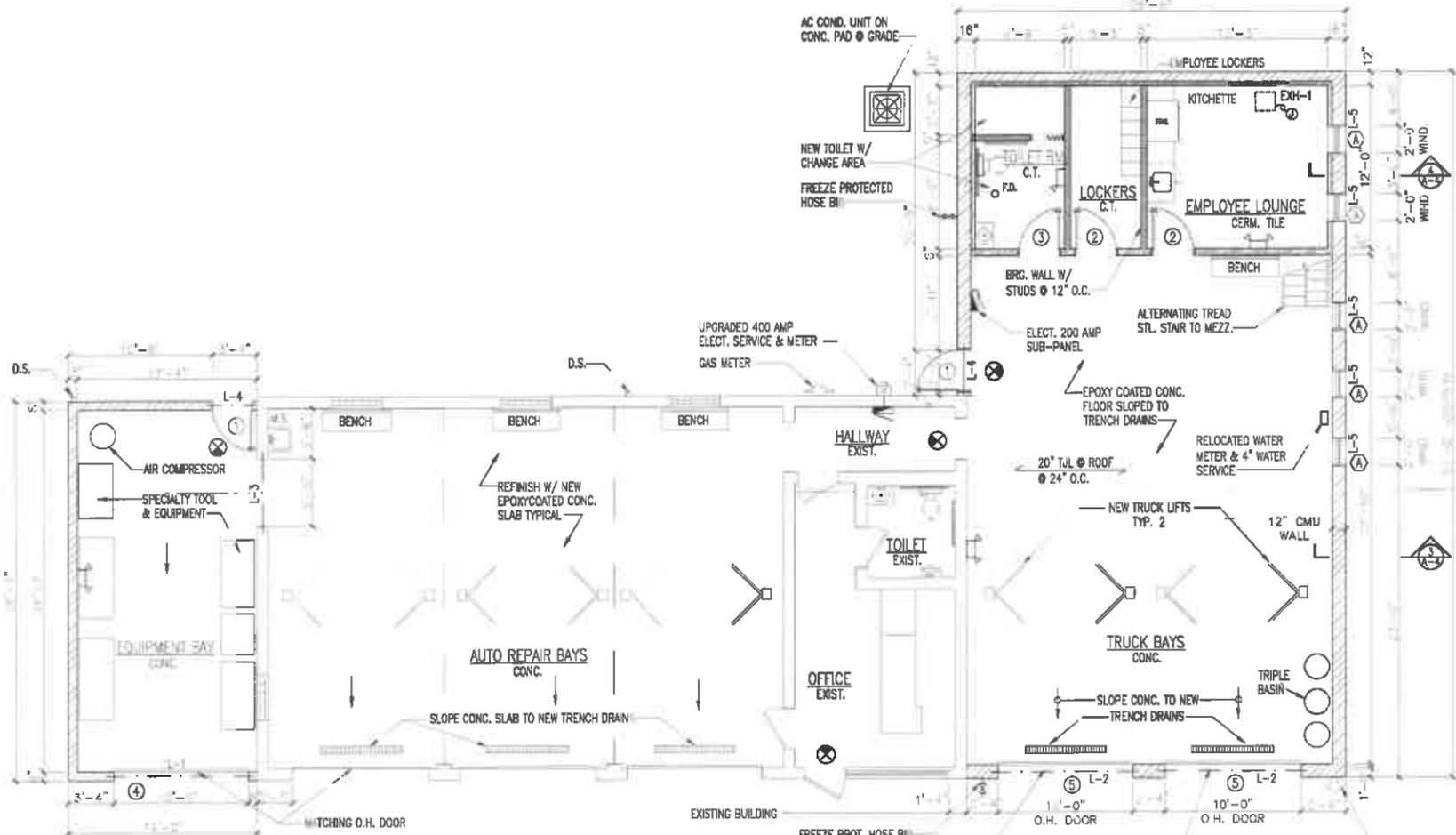
TAG	TYPE	SIZE	M.O.	LENGTH	REMARKS
L-1		C12 x 18 x 5/16" PL	10'-0"	11'-0"	WELDED & MIN. 6" BRG. EA. SIDE.
L-2		C12 x 20.7 x 5/16" PL	10'-0"	11'-0"	WELDED & MIN. 6" BRG. EA. SIDE, QTY. 2
L-3		3 1/2" x 6" x 3/8"	5'-0"	5'-8"	EXTEND 4" BEYOND M.O. (EA. SIDE)
L-4		5" x 4" x 3/8"	3'-4"	4'-0"	MIN. 4" BRG. EA. SIDE.
L-5		5" x 3 1/2" x 1/4"	2'-0"	2'-8"	MIN. 4" BRG. EA. SIDE.

NOTES: - PROVIDE MINIMUM 3" END BEARING ON ALL HEADERS.
 - LOADS MUST BE CARRIED TO BRG. COLUMNS OR BEAMS.
 - CONTRACTOR TO INSTALL COMBINATION WOOD & STEEL LINTLES FOR THE ADDITIONAL NEW DOOR & WINDOW OPENINGS AS FOLLOWS:
 * OPENINGS UP TO 6'-0", PROVIDE (2) 5x8" W/ 3 1/2" x 4" x 1/4" STL. ANGLE LINTLE @ BRICK VENEER.

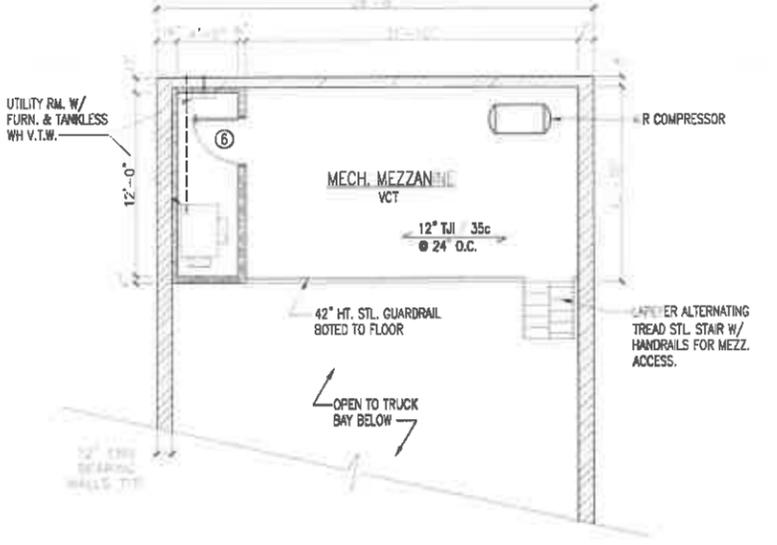
ACCESSIBILITY COMPLIANCE

GENERAL ACCESSIBILITY NOTES:

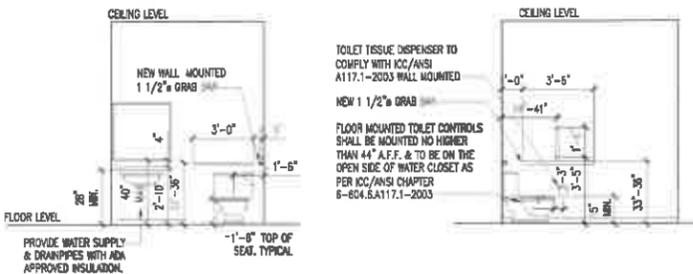
- ALL NEW DOORS LEADING INTO REQUIRED ACCESSIBLE ROOMS OR SPACES SHALL BE A MINIMUM 3'-0" WIDE A LAMER OPERATED HARDWARE AND COMPLY FULLY WITH ADA.
- 34" MINIMUM 34" CLEAR DOOR WIDTH WITH 5 LBS PUSH/PULL FORCE AT INTERIOR DOOR - (ANSI 404.2.2 & 404.2.3)
- ALL SWITCHES, OUTLETS, CONTROLS AND OPERATING MECHANISMS SHALL BE LOCATED WITHIN A REACH RANGE OF 15" A.F.F. - 48" A.F.F. AND COMPLY FULLY WITH ADA.
- ALL EMERGENCY WARNING SYSTEMS SHALL BE BOTH AUDIBLE AND VISIBLE AND COMPLY FULLY WITH ADA.
- ALL BARRIERS TO BE PROVIDED WITH APPROPRIATE BLOCKING FOR GRAB BARS IN ACCORDANCE WITH ADA.
- AMBULATORY WATER CLOSET TO BE 3'-0" MIN. WITH SIDE GRAB BARS - (ANSI 404.2.2)
- ALL DOORS USED IN CONNECTION WITH CITY SHALL BE SO ARRANGED AS TO BE READILY OPENED WITHOUT A KEY IN THE DIRECTION OF EGRESS.
- ALL DOORS LEADING INTO HAZARDOUS ROOMS SHALL HAVE KNOBBED HARDWARE AND COMPLY FULLY WITH ADA, REFER TO DOOR SCHEDULES.
- PRIVACY LOCKS - OPERATED PRIVACY HANDLES AT ALL ACCESSIBLE LOCKERS.
- EXPOSED PIPES UNDER SINK SHALL BE INSULATED.
- ALL CURB RAMPS IN SIDEWALKS TO HAVE CONTRASTING CONCRETE IN ADDITION TO DETECTABLE WARNING, PER ANSI A117.1-2003.
- TYPICAL ADA FLOOR SPACES: 30"x48" MIN. TURNING RADIUS AT 5'-0" (ANSI 304.4.3.1 & 305.2)
- MINIMUM ALLOWED PROJECTION FROM WALL SURFACE: 4" (ANSI 307.2)
- ALL AUDIBLE ALARMS TO BE SYNCHRONIZED.
- ALL CIRCUIT BREAKERS WITHIN EACH UNIT TO HAVE AN ACCESSIBLE ROUTE AND BE WITHIN 18" TO 48" A.F.F. TO HIGHEST OPERABLE POINT.



1 PROPOSED BLDG. FLOOR PLAN
 SCALE 3/16" = 1'-0"



2 MEZZANINE FLOOR PLAN
 SCALE 3/16" = 1'-0"



3 ADA TOILET RM. ELEVATIONS
 SCALE 1/4" = 1'-0"

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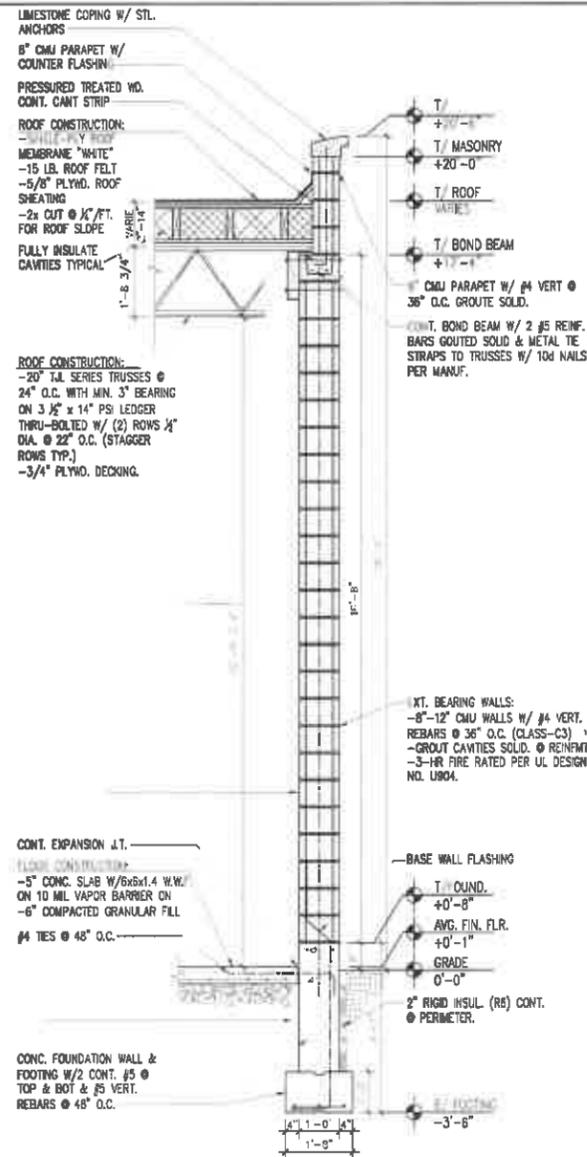
PROPOSED FLOOR PLAN NOTES AND SCHEDULES



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DATE:
 5-15-20

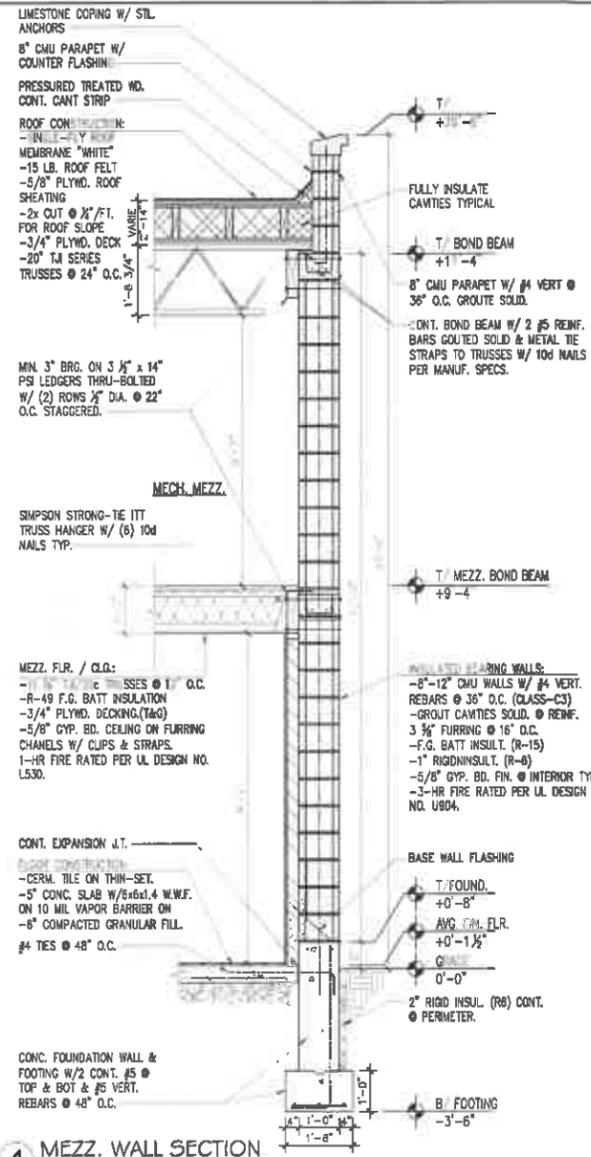
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 SHEET NO. **A-3**
 JOB NO. SHEET 3 OF 8



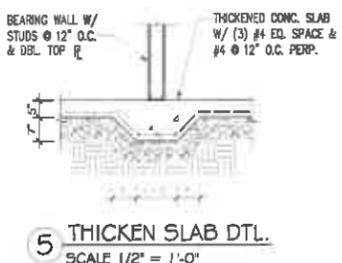
3 TYP. WALL SECTION
SCALE 1/2" = 1'-0"

NOTE:
WEST ADDITION OF SIMILAR CONSTRUCTION, BUT WITH 8" CMU & TRUSS JOIST BEARING @ 14'-0" ABOVE GRADE.

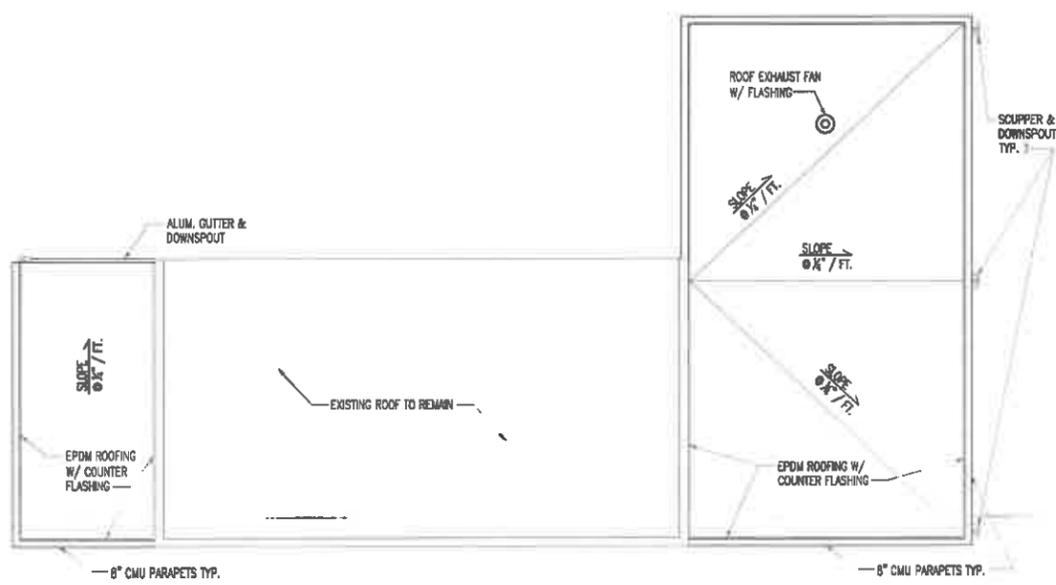
NOTE:
NEW TRUSSES TO BE COMPOSITE OPEN WEB STEEL & WOOD TRUSSES BY TRUSS JOIST MACMILLAN, INSTALLED PER MANUF. SPECIFICATIONS.



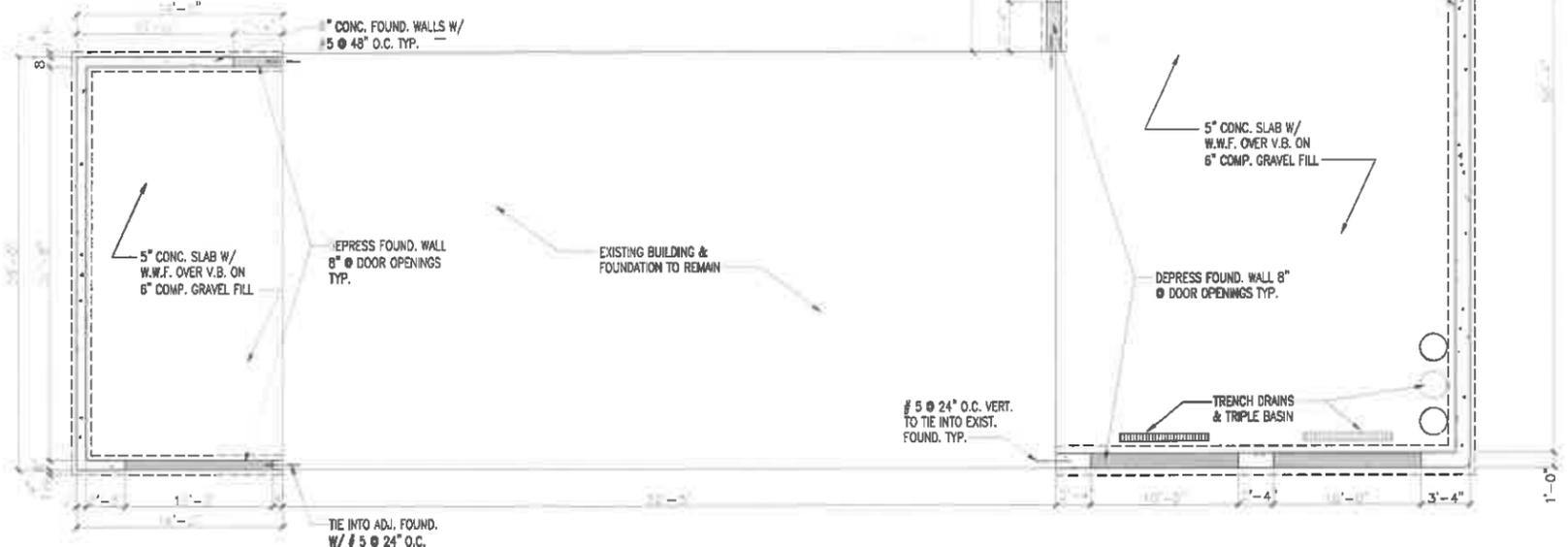
4 MEZZ. WALL SECTION
SCALE 1/2" = 1'-0"



5 THICKEN SLAB DTL.
SCALE 1/2" = 1'-0"



1 ROOF PLAN
SCALE 1/8" = 1'-0"



2 BLDG. FOUNDATION PLAN
SCALE 3/16" = 1'-0"

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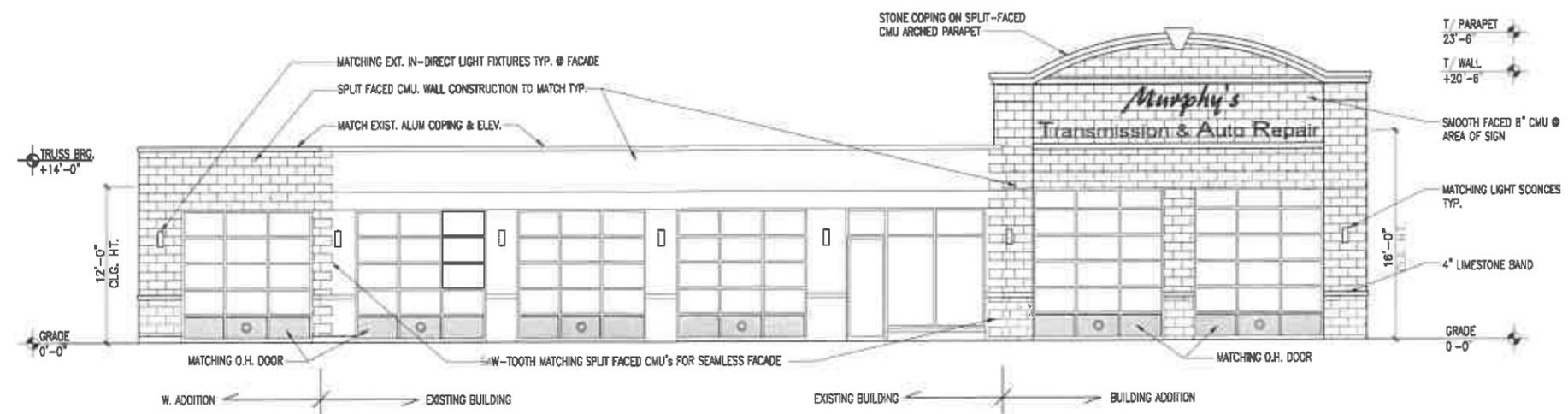
BLDG. FOUNDATION
PLAN & TYPICAL
WALL SECTIONS



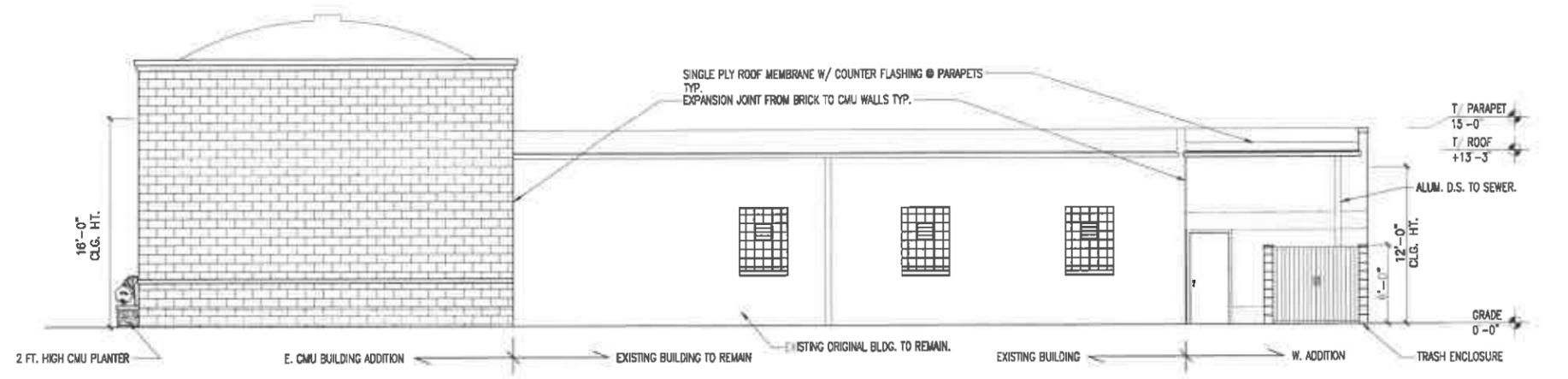
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DATE:
6-16-20

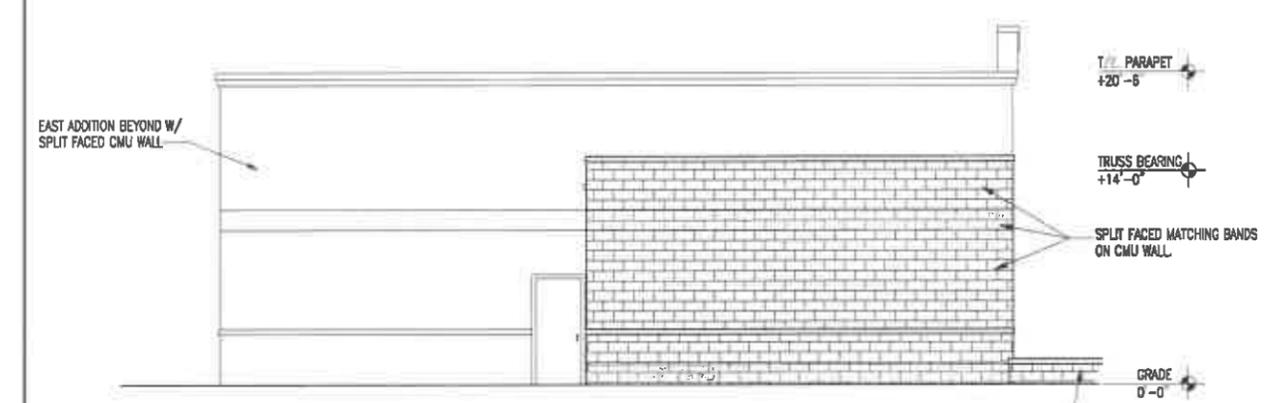
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A-4
DRAWN BY: AM
JOB NO. SHEET 4 OF 8



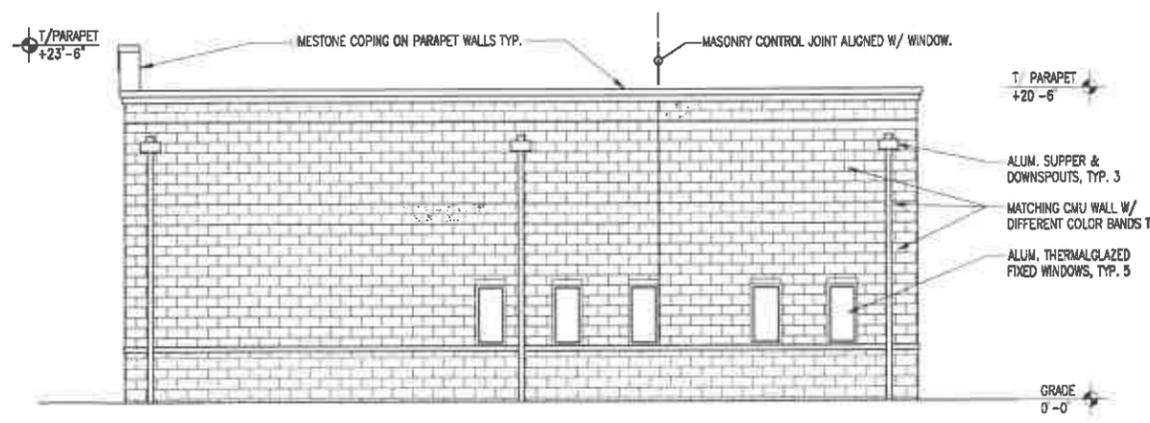
1 PROPOSED SOUTH ELEVATION
SCALE 3/16" = 1'-0"



2 PROPOSED NORTH ELEVATION
SCALE 3/16" = 1'-0"



3 PROPOSED WEST ELEVATION
SCALE 3/16" = 1'-0"



4 PROPOSED EAST ELEVATION
SCALE 3/16" = 1'-0"

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BLDG. ELEVATIONS



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DATE:
 6-16-20
 7-15-20
 MG
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 JOB NO.
 SHEET NO. **A-5**
 SHEET 5 OF 8

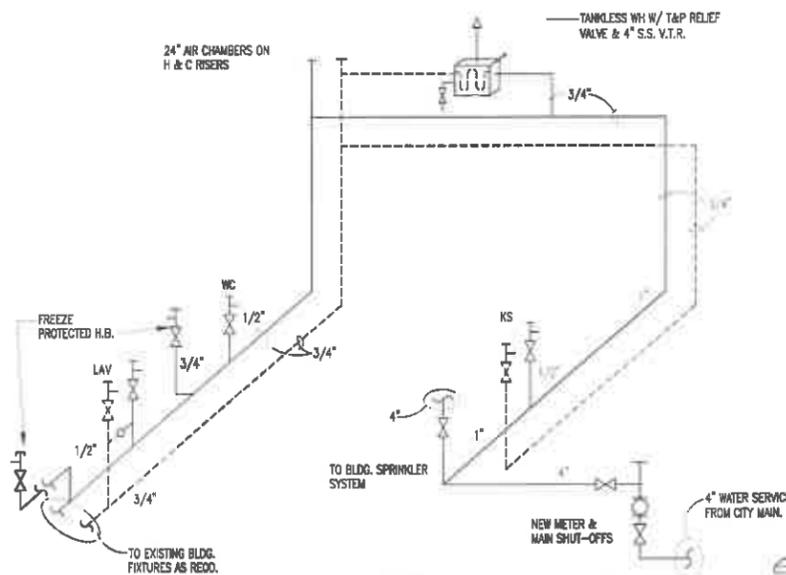
PLUMBING NOTES

1. PLUMBING CONTRACTOR SHALL FURNISH AND INSTALL ALL LABOR, MATERIALS, EQUIPMENT AND SERVICES NECESSARY TO PROVIDE A COMPLETE OPERATIONAL PLUMBING SYSTEM WHICH CONFORMS TO THE CHICAGO BUILDING CODES.
2. PLUMBING CONTRACTOR TO PROVIDE ALL FIXTURES INCLUDING:
 - * 12" AIR CHAMBERS ON ALL FIXTURES.
 - * 24" AIR CHAMBERS ON ALL RISERS.
 - * SHUT-OFF VALVES ON ALL FIXTURES
 - * FIXTURES AS SELECTED BY OWNER.
3. VERIFY EXACT LOCATION OF ALL EXISTING PUBLIC SEWERS AND WATER MAIN PIPING PRIOR TO THE PERFORMANCE OF NEW WORK.
4. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL FIELD CONDITIONS WHICH MAY AFFECT HIS WORK.
5. PLUMBING CONTRACTOR SHALL COORDINATE WITH HEATING, ELECTRICAL AND OTHER TRADES INVOLVED. HE/SHE IS ALSO TO COORDINATE NEW WORK WITH ARCHITECTURAL AND STRUCTURAL WORK.
6. PLUMBING CONTRACTORS SHALL OBTAIN AND PAY FOR ALL PERMITS, FEES, LICENSES AND CERTIFICATES OF INSPECTION FOR HIS WORK.
7. THE PLUMBING CONTRACTOR SHALL ARRANGE AND PAY FOR CUTTING, FRAMING AND FLASHING OF ALL REQUIRED ROOF OPENINGS.
8. VENT, SOIL AND WASTE PIPING ABOVE GROUND: TAR COATED SERVICE WEIGHT CAST IRON, BELL AND SPIGOT CAST IRON DRAINAGE FITTINGS WITH LEAD AND OAKUM CAULK OR CAST IRON THREADED PIPE.
9. VENT SOIL AND WASTE PIPING UNDERGROUND: TAR COATED SERVICE WEIGHT CAST IRON, BELL AND SPIGOT PIPE CAST IRON FITTINGS WITH LEAD AND OAKUM CAULK.
10. DOMESTIC WATER ABOVE GROUND INSIDE BUILDING: SEAMLESS TYPE "L" COPPER WITH WROUGHT COPPER FITTINGS SOLDERED. SOLDER SHALL CONFORM TO LOCAL CODE REQUIREMENTS AND ASTM B-32 LATEST REVISIONS.
11. VERIFY EXISTING STOP CLOCK WITH SHUT-OFF BOX (BUFFALO BOX) ON WATER SERVICES. VALVE AND BOX SHALL BE OBTAINED FROM THE DEPARTMENT OF WATER.
12. PROVIDE DIELECTRIC FITTINGS WHERE COPPER JOINS FERROUS METAL.
13. CHLORINATING OF DOMESTIC WATER SYSTEM SHALL BE REQUIRED AFTER COMPLETION OF DOMESTIC WATER SYSTEM AND BEFORE USE. AFTER CHLORINATING, OPEN ALL VALVES AND FLUSH WITH WATER UNTIL WASTE WATER INDICATES 0.5 P.P.M. RESIDUAL MAXIMUM. FURNISH OWNER WITH CERTIFICATION OF COMPLIANCE.
14. WATER AND DRAINAGE SYSTEM SHALL BE TESTED IN COMPLIANCE TO APPLICABLE CODES. FURNISH COPY OF TEST RESULTS TO OWNER.
15. ALL TRENCHES, BACK FILL, CUTTING AND PATCHING FOR TRADE WORK SHALL BE BY THE PLUMBING CONTRACTOR. ALL BACK FILL FOR TRENCHES AND EXCAVATION BE CLEAN YELLOW SAND OR GRAVEL FREE FROM SILT, CLAY OR LOAM. DO NOT BACK FILL WITH SITE MATERIAL. ALL BACK FILL SHALL BE COMPACTED IN 6" LAYERS. TAMP AND PUDDLE AS REQUIRED TO AVOID FUTURE SETTLEMENT. REMOVE ALL EXCESS EXCAVATED MATERIAL FROM SITE.
16. CONTRACTOR SHALL INSTALL ALL NECESSARY SUPPORTS, EXPANSION PIPE LOOPS, UNIONS, ACCESSIBLE AND DURABLE EXPANSION JOINTS, CLEAN CUTS, ETC. ISOLATE ALL WATER PIPING FROM STRUCTURE TO REDUCE NOISE.
17. CONTRACTOR SHALL GUARANTEE ALL WORK, MATERIAL, EQUIPMENT, ETC. PROVIDED BY HIM FOR A PERIOD OF ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE BY OWNER.

SYMB.	FIXTURE SCHEDULE	QTY.	REMARKS
LAV	LAVATORY - AMERICAN STANDARDS	1	ADA # 1 EXISTING
WC	WATER CLOSET - AM. STANDARDS	1	ADA # 1 EXISTING
KS	KIT. SINK - ELKAY	1	STN. STEEL
HB	HOSE BIB - NATIONAL	2	FREEZE PROTECTED
TD	TRENCH DRAIN - US TRENCH DRAIN	5	
TB	TRIPLE BASIN - BY PLUMBER	1	
	TOTAL NEW FIXTURES	4	2 EXIST. FIXTURES
WH	WATER HEATER- RHEEM	1	TANKLESS GAS-WATER HEATER

PLUMBING NOTES

1. ALL COPPER WASTE/VENT TO BE "M" TYPE.
2. ALL COPPER ABOVE GROUND TO BE "L" TYPE.
3. ALL COPPER BELOW GROUND TO BE "K" TYPE.
4. ALL COPPER FITTING TO BE FOREDGED WITH NO LEAD SOLDER/FLUX.
5. 24" AIR CHAMBERS ON ALL MAIN WATER RISERS.
6. 12" AIR CHAMBERS ON ALL FIXTURES
7. SHUT OFF STOP ON ALL FIXTURES.
8. PROVIDE AUTO MIXING VALVES ON ALL SHOWERS & LAVATORIES, TYPICAL.



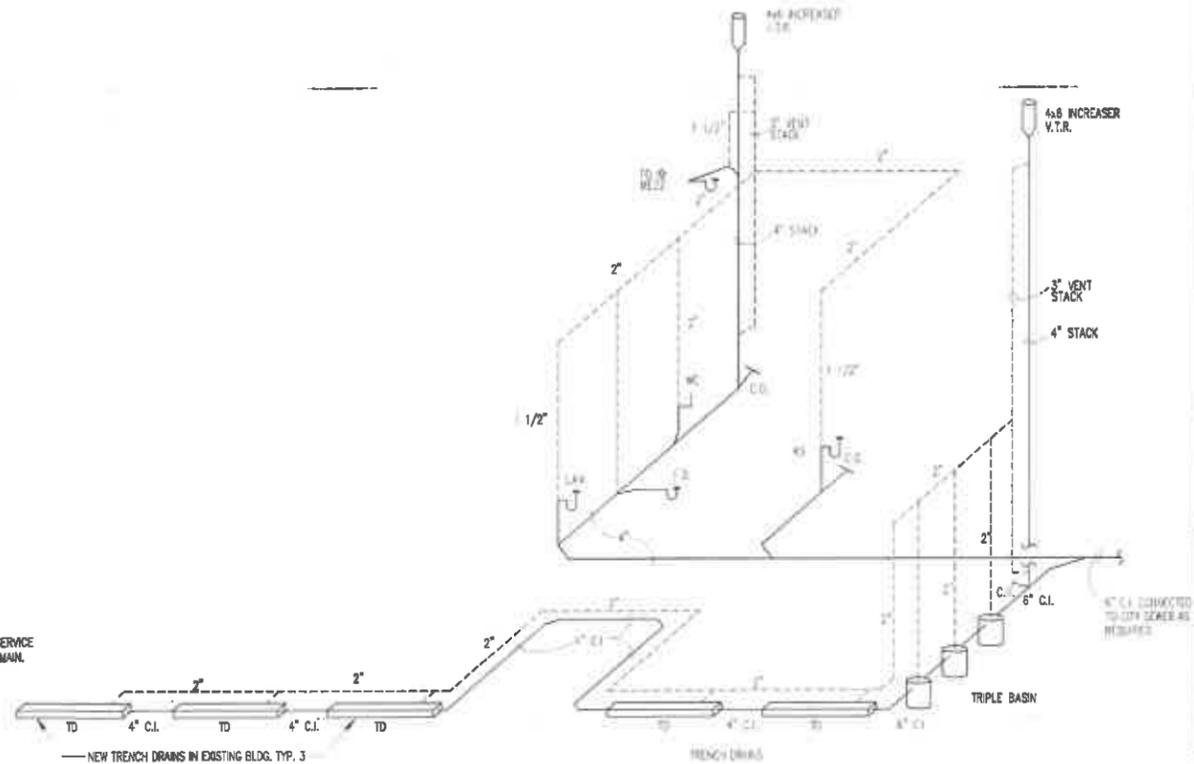
WATER SUPPLY DIAGRAM

SCALE 1/4" = 1'-0"

LEGEND

-----	HOT WATER
—————	COLD WATER

NOTES:
 * ALL WATER LINES TO BE COPPER PIPING WITH CONNECTIONS, AND 1/2" (R-3) PIPE INSULATION.



WASTE & VENT DIAGRAM

LEGEND

-----	VENT LINE
—————	WASTE LINE

NOTE: ALL PLUMBING LINES TO BE COPPER OR CAST IRON F BELOW CONC. SLAB.

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MURPHY'S AUTO REPAIR
1117 E. 31ST STREET
LAGRANGE PARK, ILLINOIS

PLUMBING DIAGRAMS & SCHEDULE



M. A. G.
 ARCHITECT & CODE CONSULTANT INC.
 208 W. WASHINGTON STREET
 UNIT 806
 CHICAGO, ILLINOIS 60606
 VOICE: 312-678-0476 FAX: 708-688-0107

DATE:
 6-15-20

SHEET NO.
P-1
 DRAWN BY: AM
 JOB NO. SHEET 6 OF 8

MECHANICAL NOTES

- ALL DUCTWORK TO BE PRIME GALVANIZED SHEET METAL WITH STRUCTURAL STRENGTH AND DURABILITY TO MEET THE FOLLOWING:
 ROUND DUCTWORK: LESS THAN 12" = 26 GA.
 12" OR MORE = 24 GA.
 RECT. DUCTWORK: LESS THAN 14" = 26 GA.
 MORE THAN 14" = 24 GA.
- JOINTS AND SEAMS OF ALL DUCTS TO BE SECURELY FASTENED AND AIR TIGHT. SUP JOINTS TO HAVE MIN. LAP OF LEAST 1".
- SOUND LEVEL OF ALL DUCT SYSTEMS AND MECH. EQUIPMENT NOT TO EXCEED 55 DECIBELS @ 10' LINE.
- ALL SUPPLY DUCTWORK TO HAVE LOCKING TYPE DAMPERS PER CSC 28(13-184-080)
- FLOOR REGISTERS NOT TO EXCEED BY MAX. FROM VERTICAL FACE OF WALL. WALL REGISTERS TO BE MOUNTED MIN. 1" A.F.F.
- GAS FIRE FURNACE TO BE EQUIPPED WITH HUMIDIFICATION DEVICE TO MAINTAIN A RELATIVE HUMIDITY OF 45% TYP.
- ALL DUCTWORK IN NON-TENPERED SPACES AND CHAM. SPACES TO BE INSULATED WITH MIN. 1" ALUM. FOL. FACED INSULATION WRAP.
- ALL CLASS "B" FLUES FOR FURNACES AND HOT WATER HEATERS TO EXTEND MIN. 6'-0" ABOVE FLOOR LINE FOR FLAT ROOFS OR 2'-0" ABOVE 1/4" HORIZONTAL PROJECTION FROM ROOF PITCH.
- ALL FORCED AIR FURNACE SYSTEMS TO BE INSTALLED UNDER THE LATEST EDITION OF THE ASHRAE DESIGN STANDARDS AND COMPLY WITH THE SMACNA STANDARDS.
- MINIMUM VELOCITIES OF DUCTWORK IS AS FOLLOWS:
 MAIN FLEDS: 800 FPM
 BRANCH LINES: 600 FPM
 RISER LINES: 600 FPM
 REGISTERS: 800 FPM
- WARM AIR HEATING SYSTEMS TO BE CAPABLE OF HEATING ALL HABITABLE ROOMS FROM -10 DEGREES F. OUTDOOR TEMP. TO 70 DEGREES F. INDOOR TEMP. 80 DEGREE TEMPERATURE RISE TYP.
- ALL RETURN QUANTITIES SHALL EQUAL TO 66% OF SUPPLY QUANTITIES TO SPACES. NO RETURN SHALL BE PERMITTED FROM BASEMENTS, BATHS, KITCHENS, UTILITIES AND LAUNDRIES ROOMS.
- A CARBON MONOXIDE DETECTOR SHALL BE INSTALLED WITH IN 4'-0" OF ALL SLEEPING ROOMS AND AS CLOSE TO MAIN SOURCES OF CONTAMINATION i.e. FURNACES & HOT WATER HEATERS.

MECHANICAL VENTILATION SCHEDULE

ROOM DESCRIPTION	AREA	VENTILATION				HEAT LOSS BTU/H	DESIGNED UNIT	REMARKS/
		CODE		ACTUAL				
		SUP	EXH	SUP	EXH			
EMP. LOUNGE	183	245	245	300	248	FN-1 EXH-1		
LOCKER RM.	63	NR	76	100	80	FN-1 EXH-2	VA TRANSFER GRILL	
TOILET RM.	84	NR	158	100	172	FN-1 TE-1		
EXISTING OFFICE	163	98	49	300	52	FN-1 EXH-3		
TRUCK BAY	1032	1032	1032	1200	1101	UH-1 EXH-2		
EQUIPMENT BAY	355	355	355	300	367	FN-2 EXH-4		
AUTO BAYS	1010	EXISTING TO REMAIN				FN-2 EXH-2	EXISTING TO REMAIN	
EXISTING TOILET	44	NR	65	50	90	FN-1 TE-2	EXISTING	
TOTAL	2,114	1,730	2,013	2,480	2,110	22,7 + 15% = 26,111 BTU/H		

MECHANICAL EQUIPMENT LIST

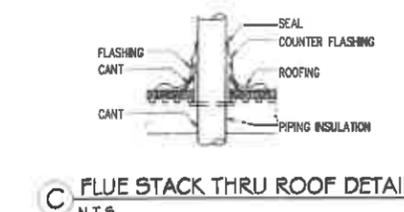
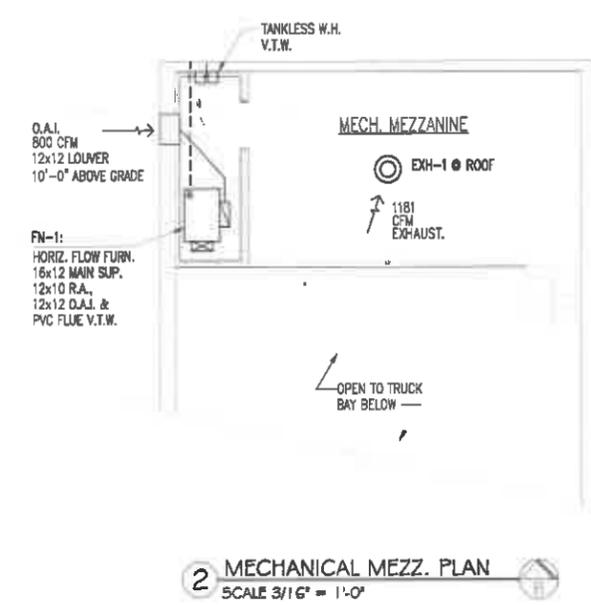
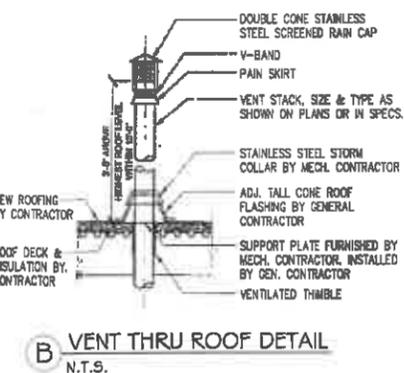
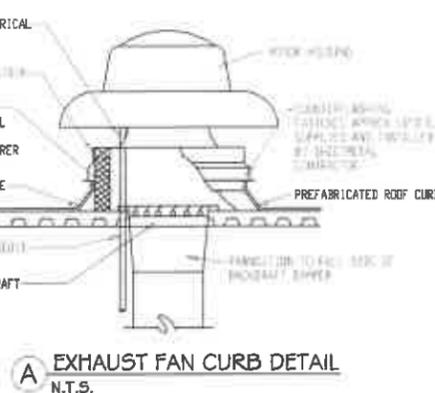
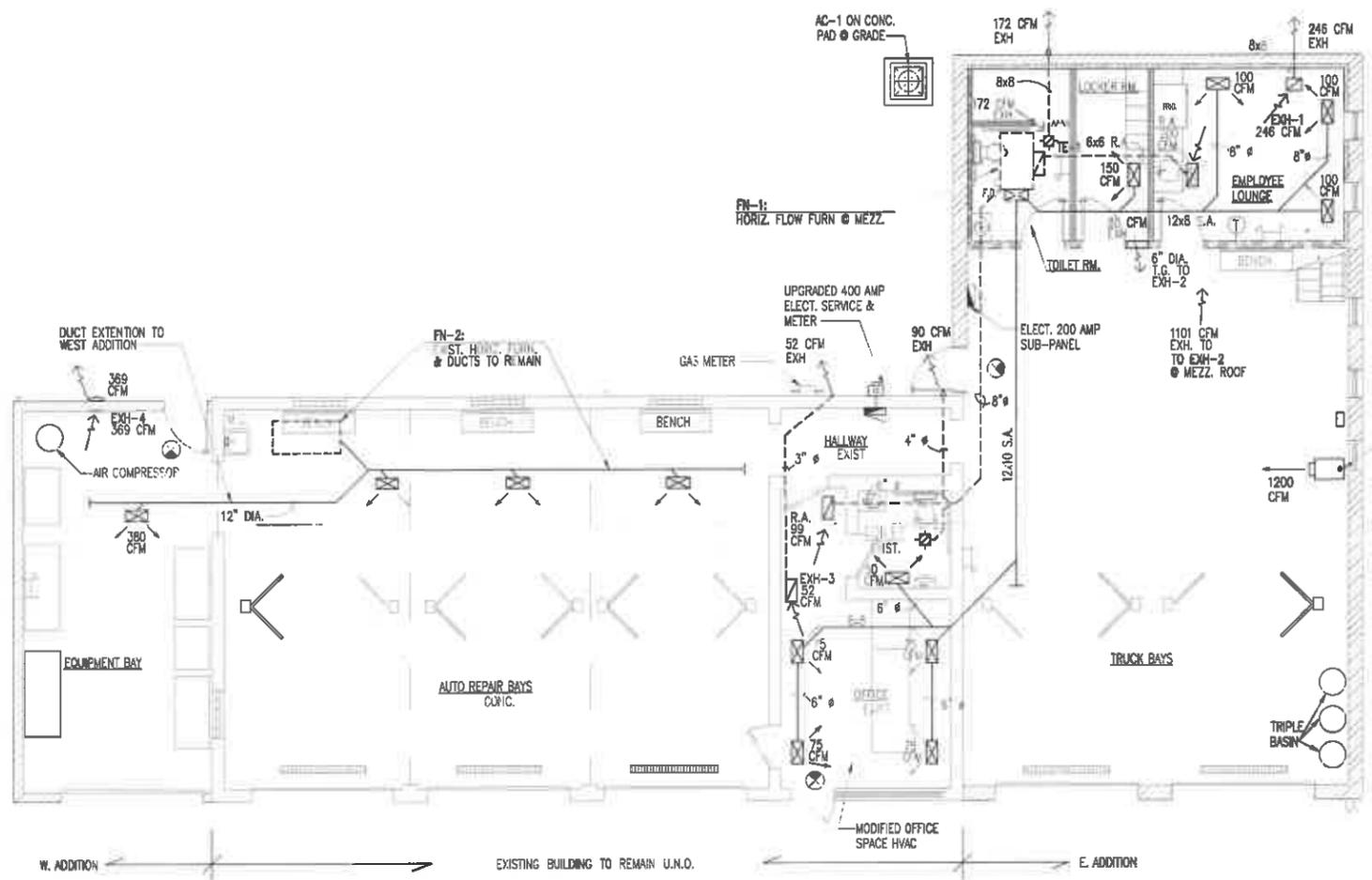
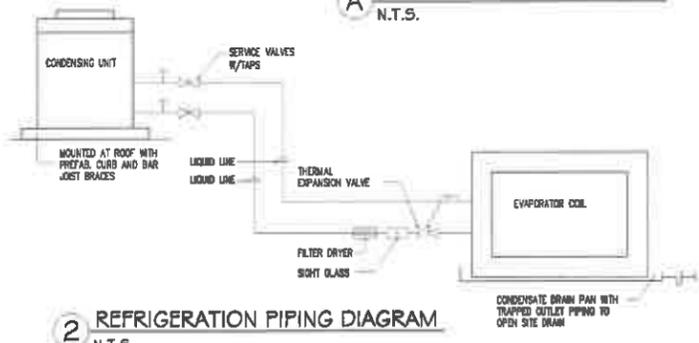
- FN-1 HORIZONTAL FLOW FURNACE, YORK LATITUDE SERIES MDL # TG950602MPLI INPUT-50,000 BTU/H, OUTPUT-57,000 BTU/H, 1,200 CFM, 95.0% AFUE, 122 LBS. MOUNTED IN MEZZANINE WITH AIR CLEANER, HUMIDIFIER AND PROGRAMMABLE THERMOSTAT ALONG WITH AC-1 AFFINITY SERIES 5-TON CONDENSER INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
- FN-2 EXISTING FURNACE, GAMMA MDL # PGBVAB0360BACBA INPUT-50,000 BTU/H, OUTPUT-74,000 BTU/H, 95% AFUE, 1/2 HP, 7.7 AMPS, 1,600 CFM, MOUNTED ON PLATFORM 6 FT. A.F.F.
- UH-1 UNIT HEATER, REZOR MODEL NO. 7165 INPUT-165,000 BTU/H, OUTPUT-182,000 BTU/H, 80% EFF, 1,200 CFM, 1,050 RPM, 4.0 AMPS, 149 LBS / UNIT, 8" DIA. FLUE VENT THRU ROOF WITH FLASHING & PROGRAMMABLE THERMOSTATE CONTROLLER, PER MANUF. SPECIFICATIONS.
- EXH-1 EXHAUST FAN, GREENHECK MDL # SP-A250-00: CEILING MTD, EXHAUST UNIT, 246 CFM EXH., 1,000 RPM, 2.9 SONES, 11 7/8" x 14" WITH 8" DIA. DUCT VENTED TO EXTERIOR LOUVER. INSTALL PER MANUFACTURER'S SPECIFICATIONS.
- EXH-2 EXHAUST FAN, GREENHECK MDL # GP 101: 1151 CFM EXH., 1725 RPM, 11.9 SONES, FROM ROOF MTD. UNIT W/ FLASHING, 34 1/2" DIA. & 20" HT.
- EXH-3 EXHAUST FAN, GREENHECK MDL # SP-C50-00: 52 CFM EXH., 2.9 SONES, 4.6 WATTS, 0.6 AMPS & 3" DIA. DUCT VENTED TO EXTERIOR W/ BACK DRAFT DAMPER.
- EXH-4 EXHAUST FAN, GREENHECK MDL # CW-070: 369 CFM EXH., 5.5 SONES, 1550 RPM, SIDE WALL EXHAUST VIA 8 1/2" x 8 1/2" OPENING W/ FLASHING PER MANUF. SPECS.
- TE-1 TOILET EXHAUST FAN, GREENHECK MDL # SP-A800-00: 172 CFM EXH., 900 RPM, 1.9 SONES, 4.6 WATTS & 8" X 8" DUCT VENTED TO THE EXTERIOR.
- TE-2 EXISTING TOILET EXHAUST FAN TO REMAIN, 90 CFM EXH.

REFRIGERATION SCHEDULE

COMP. UNIT	LOCATION	REFRIG.	REFRIG. QTY.	# OF COMP.	RATED TONS	H.P.	RELIEF VALVE	SELF CONTAINING	COMP. TYPE	REMARKS
A	AC-1 # C2R3B14	GRADE	R-410A	4 LBS 3 OZ	1	3	3.0	✓	REMOTE CENTRIFUGAL	200 1/2 TONS

REFRIGERATION NOTES:

- ALL REFRIGERANT PIPING SHALL BE TYPE K-COPPER WITH BRAZED JOINT. OR ACR IF WITHIN RATED CAPACITY.
- REMOVE ALL EXPANSION VALVES, DEVICES, AND CONNECTIONS FROM AIR STREAM.
- PROVIDE 1/2" PRV AT COMPRESSOR DISCHARGE SET AT 450 PSF. THERE SHALL BE NO INTERVENING VALVES, DEVICES, ETC.
- DISTANCE BETWEEN CONDENSER UNIT & EVAPORATOR COIL SHALL NOT EXCEED 30 FEET.
- PIPING SHOWN FOR REFERENCE ONLY. PROVIDE TRAPS ETC. AS REQUIRED PER MANUFACTURER'S RECOMMENDATIONS.
- REFRIGERANT RELIEF VALVE IS TO BE LOCATED ON THE HIGH SIDE OF COMPRESSOR DISCHARGE BEFORE SHUT-OFF VALVE.



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MURPHY'S AUTO REPAIR
1117 E. 31ST STREET
LAGRANGE PARK, ILLINOIS

MECHANICAL PLAN AND SCHEDULES



M. A. G.
ARCHITECT & CODE CONSULTANT INC.
208 W. WASHINGTON STREET
UNIT 808
CHICAGO, ILLINOIS 60606
VOICE: 312-578-0475 FAX: 708-688 0107

DATE: 6-15-20
SHEET NO. **M-1**
DRAWN BY: AM
JOB NO. SHEET 7 OF 8

ELECTRICAL NOTES

- EXECUTION:**
- REFER TO THE ARCHITECTURAL DRAWINGS TO COORDINATE LOCATIONS OF THE ELECTRICAL EQUIPMENT, UNLESS OTHERWISE NOTED. MOUNTING HEIGHTS SHALL BE AS FOLLOWS:
 - RECEPTACLES AND COMMUNICATIONS OUTLETS SHALL BE MOUNTED 15" AFF TO THE CENTERLINE.
 - SWITCHES SHALL BE MOUNTED 42" TO THE CENTER LINE.
 - ABOVE COUNTER OUTLETS AND SWITCHES SHALL BE MOUNTED AT 48" AFF TO THE CENTERLINE, BUT NO LESS THAN 3-1/2" ON THE CENTERLINE ABOVE THE BACKSPASH.
 - TELEPHONES SHALL BE MOUNTED 48" AFF TO THE CENTERLINE.
 - HYAC USER LOCAL DISCONNECT SWITCHES SHALL BE MOUNTED 54" AFF TO THE CENTERLINE.
 - EPO-EMERGENCY POWER OFF PUSH BUTTONS SHALL BE MOUNTED 54" TO THE CENTERLINE FOR KITCHEN PANEL.

- CLOSEOUT:**
- UPON COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL BALANCE EACH PANEL SO THAT THERE IS NO MORE THAN +/- 1.0% DIFFERENCE BETWEEN PHASES. THE LOAD SHALL BE MONITORED DURING THE PEAK AM DEMAND PERIOD. HOWEVER, THE RECONFIGURATION OF THE PANEL SHALL OCCUR AFTER THE CLOSE OF BUSINESS. THE SCHEDULING OF ALL THE WORK SHALL BE WITH THE GENERAL CONTRACTOR AND THE OWNER. SUBMIT REPORT TO THE ENGINEER/OWNER.
 - THE CONTRACTOR SHALL PROVIDE NEW TYPE-WRITE PANEL DIRECTORIES FOR ALL PANELS CHARGED OR ADDED. PROVIDE ENGRAVED PLASTIC LABELS FOR ALL NEW PANELS AND DISTRIBUTION EQUIPMENT.
 - PRIOR TO THE FINAL ACCEPTANCE, THE CONTRACTOR SHALL PROVIDE A WRITTEN CERTIFICATE THAT ALL THE EQUIPMENT AND SYSTEMS HAVE BEEN PROPERLY INSTALLED PER CODE, CLEANED, ADJUSTED AND TESTED. INCLUDE IN THE CERTIFICATE, CORRESPONDENCE FORM EACH EQUIPMENT MANUFACTURERS REPRESENTATIVE THAT THE CONFIGURATION OF THEIR EQUIPMENT, SYSTEM & THE INSTALLATION CONFORM TO THE MANUFACTURERS REQUIREMENTS.

- WIRE:**
- BRANCH CIRCUIT WIRE FOR USE IN INTERIOR DRY LOCATION #8 AWG AND SMALLER SHALL BE TYPE THHN COPPER CONDUCTORS. ALL OTHER SIZE WIRE FOR USE IN INTERIOR DRY LOCATIONS SHALL BE DUAL RATED THHN/THWN 600 VOLT INSULATED COPPER CONDUCTORS. WIRE WHICH IS INSTALLED IN DAMP OR WET LOCATIONS SHALL BE TYPE XHHW-2, 600 VOLT INSULATED COPPER. NO WIRE SMALLER THAN NO. 12 AWG SHALL BE USED FOR LIGHTING OR POWER WIRING. WIRE NO. 10 AND SMALLER SHALL BE SOLID, WIRE NO. 8 AND LARGER SHALL BE STRANDED. CONTROL WIRE SHALL BE 14 AWG STRANDED.

- LIGHTING:**
- THE LIGHTING CONTRACTOR SHALL VERIFY THE CEILING TYPE BEFORE ORDERING LIGHTING FIXTURES. FIXTURES SHALL BE PROVIDED WITH THE PROPER FRAME OR ADAPTOR TO RECEIVE THE TYPE OF CEILING, COMPLETE WITH LAMPS, LENSES AND CAPS. MOUNTING HARDWARE, ETC.
 - EACH LIGHTING FIXTURE SHALL BE RIGIDLY SUPPORTED FROM THE BUILDING CONSTRUCTION AND SHALL INCLUDE SUSPENSION HANGERS, AND OTHER WORK FOR FIXTURE SUPPORT.

- LAMPS AND BALLASTS:**
- FLUORESCENT AND COMPACT FLUORESCENT LAMPS SHALL BE TRIPHOSPHOR TYPE, COLOR TEMPERATURE OF 3500K AND A COLOR RENDERING INDEX OF NOT LESS THAN 72. MANUFACTURED BY GENERAL ELECTRIC, OSRAM/SYLVANIA OR PHILIPS.
 - BALLASTS SHALL CONSIST OF THE FOLLOWING:
 - FLUORESCENT LAMP BALLASTS SHALL BE ELECTRONIC, WITH A MAXIMUM TOTAL HARMONIC DISTORTION LESS THAN 1.0 % HIGH POWER FACTOR TYPE, CLASS A SOUND RATING.
 - COMPACT FLUORESCENT BALLASTS SHALL BE HIGH POWER FACTOR TYPE.
 - MANUFACTURED BY GENMOTOR/OLA, ADVANCE, ENERGY SAVING OR UNIVERSAL.

- DISTRIBUTION:**
- NEW PANELBOARD SHALL UTILIZE BOLT ON TYPE BRANCH CIRCUIT BREAKERS, WITH WITHSTAND RATINGS EXCEEDING THE AVAILABLE SHORT CIRCUIT CURRENT. MANUFACTURED BY SEIMANS, SQUARE D, CUTLER, HAMMERVESTINGHOUSE, GUS BERTHOLD, BRICKSON OR PETERSON.

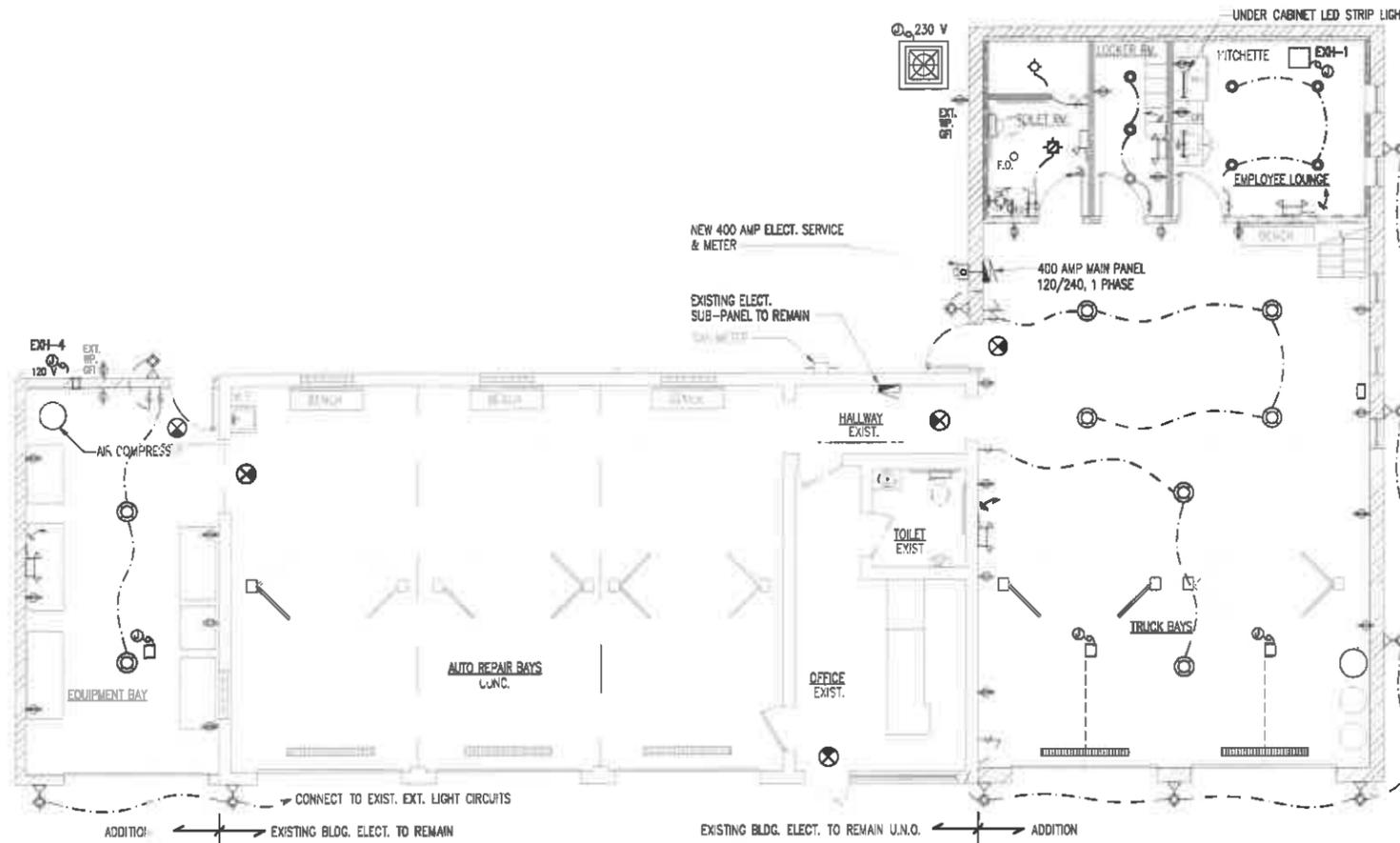
- MECHANICAL/ELECTRICAL:**
- CONTRACTOR SHALL WIRE, SET AND INDIVIDUAL MOTORS, CONTROLS AND EQUIPMENT.
 - PROVIDE LOCAL DISCONNECT SWITCHES FOR ALL MOTORS.

ELECTRIC SYMBOL KEY

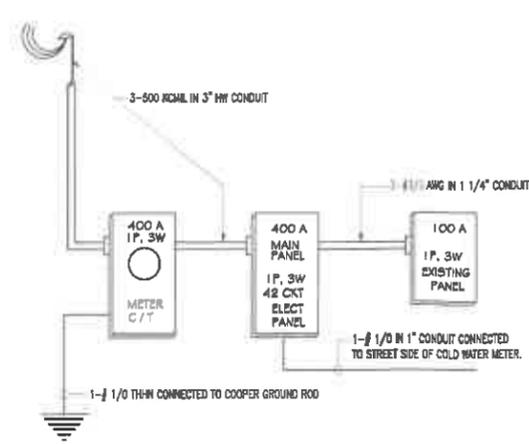
SYMBOL	DESCRIPTION
	WALL SWITCH (S) - TWO WAY SWITCH 48" A.F.F.
	THREE (3) WAY SWITCH
	DUPLX OUTLET, 18" A.F.F. (TYP. U.N.O.)
	GROUND-FAULT INTERRUPTER DUPLX OUTLET
	ARC-FAULT INTERRUPTER DUPLX OUTLET
	CEILING MOUNTED LIGHT FIXTURE (14 W LED), QTY. 2.
	SMOKE DETECTOR (HARD WIRED), QTY. 1
	CARBON MONOXIDE DETECTOR (HARD WIRED), QTY. OF 1
	EXHAUST FAN W/ 11" W. LAMP, QTY. OF 2
	EXTERIOR CEILING MTD. LED LAMP
	EXTERIOR LIGHT (WALL MTD. LED) (14 W), QTY. 10
	JUNCTION BOX 110 V. OR 250 V.
	WALL MTD. FIXTURE (14 W LED) LAMP, QTY. 1
	VANITY FIXTURE (2) 27 W CFL LAMPS QTY. 3
	2x4 LED LIGHTS E-COHO LIGHT # ETR24L2503U 50 W. LED, 5000 LUMENS & 120 V. TYPICAL, QTY. 35
	EXIT SIGN (PSURE LITE) OR EQUAL W/ QTY SYMBOL QTY. 3.
	1x4 LED PANEL CREP E-CR14-0104 40 W. & 4000 LUMENS, QTY. 30
	EMERGENCY LIGHT (PSURE LITE) OR EQUAL QTY. 5
	LED STRIP LIGHTS (9 w / EA.) UNDERCABINET OR COVE MTD.
	LED RECESSED LIGHTS 4" DIA., IC RATED, 12 w, QTY. OF 7
	LED LOW BAY CREE LAMP 8000 LUMENS, 79 W, W/ ALUM. REFLECTOR # E-ALB107CU QTY. OF 9.

ELECTRICAL SUB-PANEL SCHEDULE

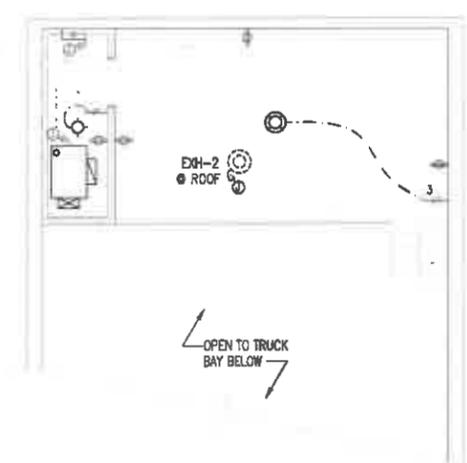
#	ROOM / SPACE	CIRCUIT
1	TRUCK BAYS	20 AMPS
2	BAY EQUIPMENT	40 AMPS
3	EMPLY. LOUNGE	20 AMPS
4	LOCKER RM.	15 AMPS
5	TOILET ROOM	15 AMPS
6	MEZZANINE	20 AMPS
7	FURNACE	20 AMPS
8	AC UNIT	30 AMPS
9	EXTERIOR LIGHTS	15 AMPS
10	EQUIPMENT BAY	20 AMPS



1 ELECTRICAL FLOOR PLAN
SCALE 3/16" = 1'-0"



3 ELECTRICAL RISER DIAGRAM
400 AMP - 3 PHASE



2 ELECTRICAL MEZZ. PLAN
SCALE 3/16" = 1'-0"

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MURPHY'S AUTO REPAIR
1117 E. 31ST STREET
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ELECTRICAL PLAN AND SCHEDULES



M. A. G.
ARCHITECT & CODE CONSULTANT INC.
208 W. WASHINGTON STREET
UNIT 806
CHICAGO, ILLINOIS 60606
VOICE: 312-578-0475 FAX: 708-888 0107

DATE:
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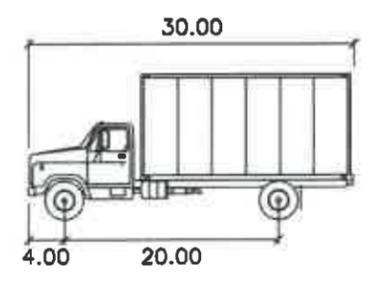
SHEET NO.
E-1
DRAWN BY: AM
SHEET 8 OF 8
JOB NO.

PROJECT:
 Murphy's Auto Repair
 1117 E. 31st Street
 LaGrange Park, Illinois

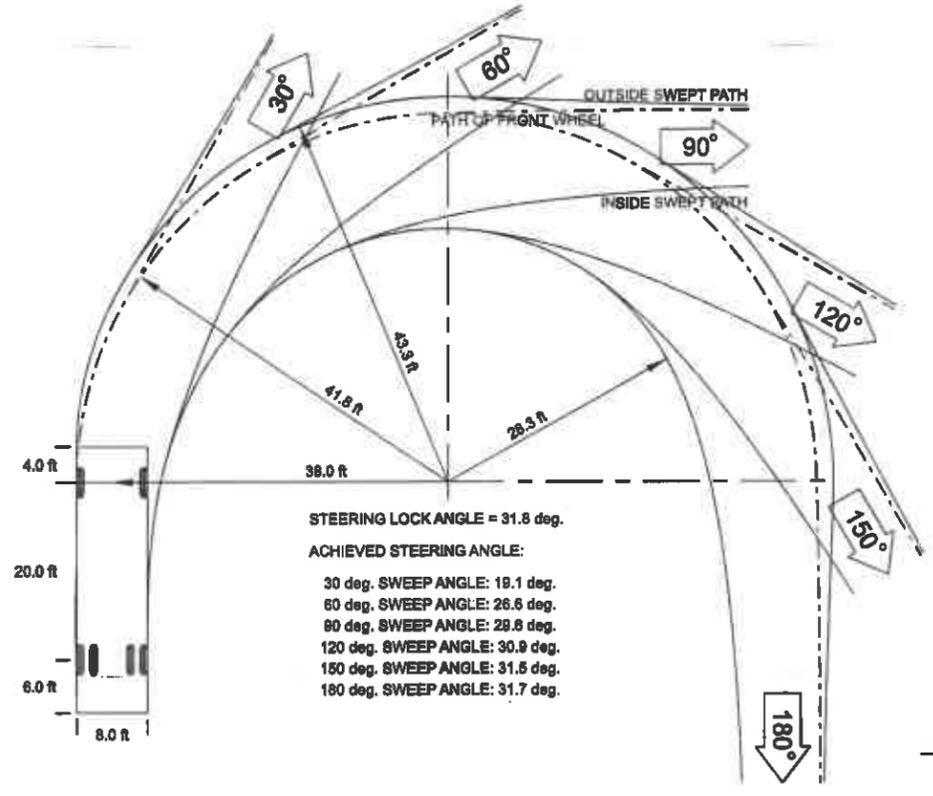
PREPARED FOR:
 Murphy's Auto Repair
 1117 E. 31st Street
 LaGrange Park, Illinois

NO.	DATE	DESCRIPTION
2	8/14/20	Revised
1	8/1/20	Date Issued

AUTOTURN EXHIBIT A

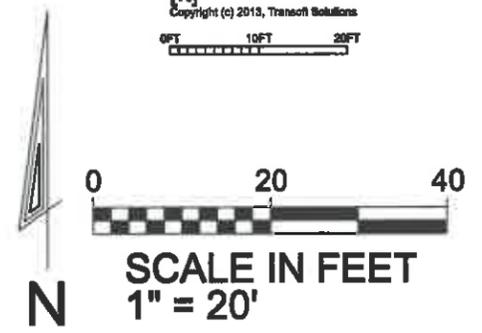


SU feet
 Width : 8.00
 Track : 8.00
 Lock to Lock Time : 6.0
 Steering Angle : 31.8



SU
 AASHTO 2004 (US)

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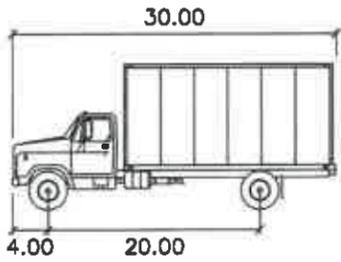
SU
 AASHTO 2004 (US)

PROJECT:
 Murphy's Auto Repair
 1117 E. 31st Street
 LaGrange Park, Illinois

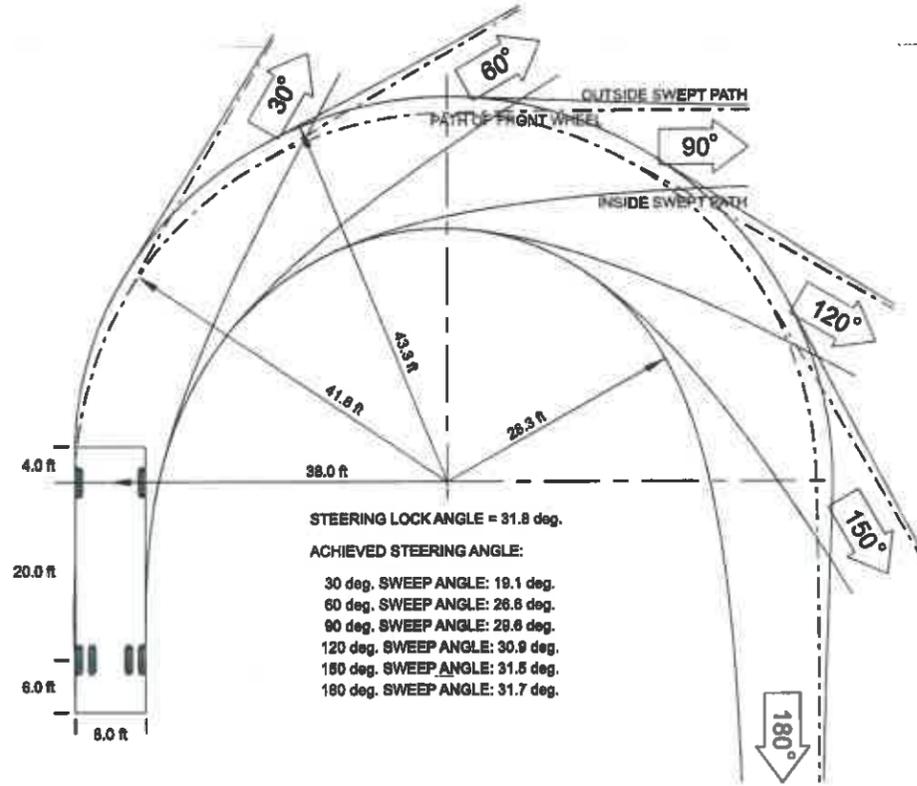
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 1117 E. 31st Street
 LaGrange Park, Illinois

NO.	DATE	DESCRIPTION
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1	8/1/20	Date Issued

AUTOTURN EXHIBIT B



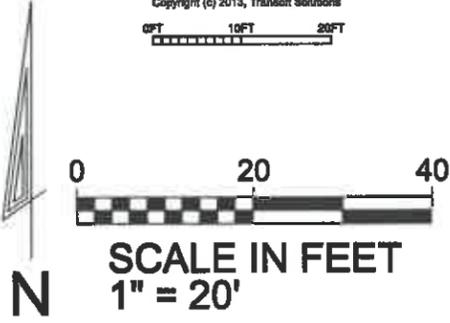
SU feet
 Width : 8.00
 Track : 8.00
 Lock to Lock Time : 6.0
 Steering Angle : 31.8



STEERING LOCK ANGLE = 31.8 deg.
 ACHIEVED STEERING ANGLE:
 30 deg. SWEEP ANGLE: 19.1 deg.
 60 deg. SWEEP ANGLE: 26.6 deg.
 90 deg. SWEEP ANGLE: 28.6 deg.
 120 deg. SWEEP ANGLE: 30.9 deg.
 150 deg. SWEEP ANGLE: 31.5 deg.
 180 deg. SWEEP ANGLE: 31.7 deg.

SU
 AASHTO 2004 (US)

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16' PUBLIC ALLEY

WEST ADDITION

EXISTING 1-STORY METAL BUILDING

EAST ADDITION

KEMMAN AVE.

31 ST. STREET

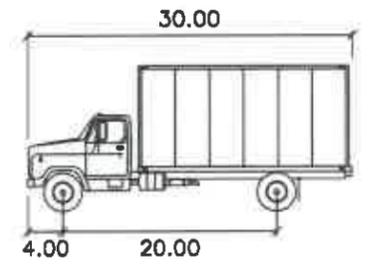
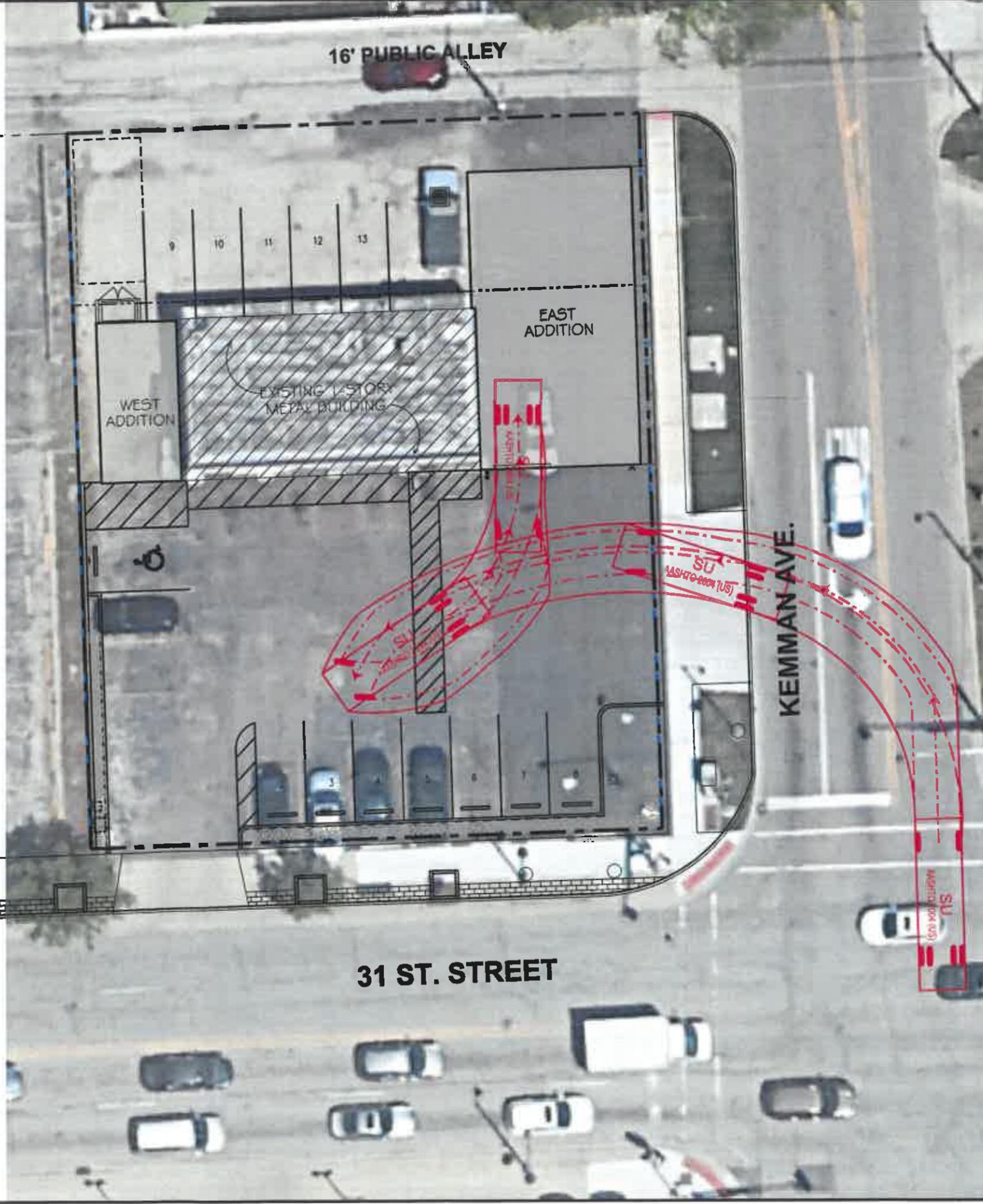
PROJECT:
 Murphy's Auto Repair
 1117 E. 31st Street
 LaGrange Park, Illinois

PREPARED FOR:
 Murphy's Auto Repair
 1117 E. 31st Street
 LaGrange Park, Illinois

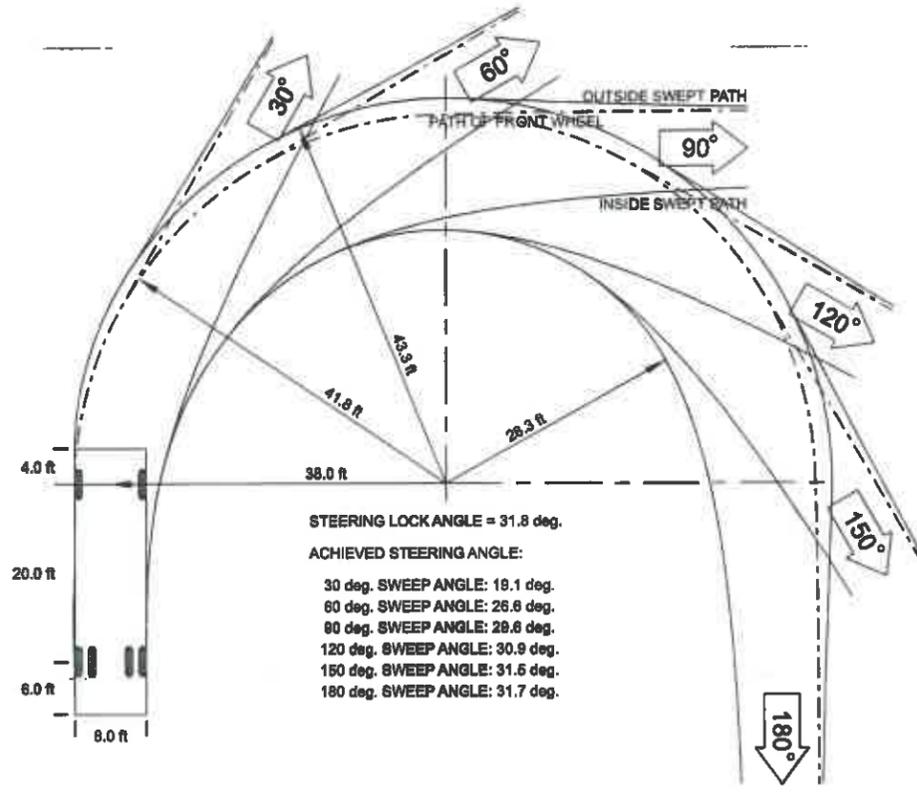
NO.	DATE	DESCRIPTION
2	8/14/20	Revised
1	8/1/20	Date Issued

CROSS ENGINEERING & ASSOCIATES, INC. © 2020

AUTOTURN EXHIBIT C

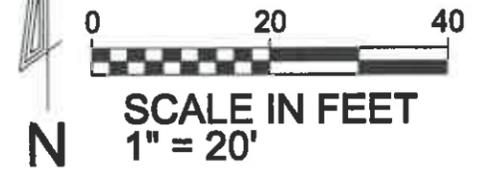


SU **feet**
 Width : 8.00
 Track : 8.00
 Lock to Lock Time : 6.0
 Steering Angle : 31.8



SU
AASHTO 2004 (US)
[ft]

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August 5, 2020

Ms. Emily Rodman, AICP
Assistant Village Manager
Village of LaGrange Park
447 N. Catherine Avenue
LaGrange Park, IL 60526

Re: Murphy's Auto Repair: 1117 East 31st Street
Zoning Review
520-20-17070

Dear Ms. Rodman:

At your direction, our office has reviewed the information provided in the Zoning Review Form packet distributed by the Village August 3, 2020 for zoning related issues regarding the above referenced project. Based upon the information provided we did not identify any engineering issues or concerns related to this request.

The proposed addition would be in an area that is currently paved (impervious) and would not create any additional storm water runoff. However, the submitted plans do not contain much information that will be required before an engineering review (to obtain a building permit) can be performed. Additional items that will be required include more complete utility connection information and grading plans.

If you should have any questions or concerns, please contact our office at your earliest convenience.

Sincerely,

EDWIN HANCOCK ENGINEERING CO.

Mark W. Volk, P.E.
Principal



August 3, 2020

Dear Property Owner:

Please find enclosed a copy of a legal notice of public hearing regarding the property located at 1117 E. 31st Street (Murphy's Transmission and Complete Auto Repair). The petitioner is Michael Engel. The petitioner is requesting a special use permit for the expansion of the existing "motor vehicle service and repair, minor" use. The petitioner is also requesting the following variations:

- a) To reduce the required loading berth length;**
- b) To reduce the minimum required distance from an unenclosed loading berth to a residential property line;**
- c) To allow for parking spaces in the front yard;**
- d) To reduce the minimum required width of perimeter parking lot landscaping; and**
- e) To reduce the required number of required parking lot islands.**

The petitioner is requesting the above approvals in order to facilitate two building additions and the reconfiguration of the existing parking field.

The Planning & Zoning Commission will convene a public hearing on Wednesday, August 26, 2020 at 7:00 p.m. in the Board Room of the Village Hall, 447 North Catherine Avenue, La Grange Park, Illinois, to consider the application.

A copy of the applications are available for review at Village Hall during current business hours; Monday through Friday, 9:00 a.m. - 4:30 p.m. If your schedule does not permit your attendance at the hearing and you wish to present comments, you may do so by submitting them in writing to the undersigned.

If you have any questions concerning this matter, please contact me at (708) 354-0225 or at erodman@lagraangepark.org.

Sincerely,

**Emily Rodman, AICP
Assistant Village Manager
Village of La Grange Park**



**NOTICE OF PUBLIC HEARING BY THE
PLANNING & ZONING COMMISSION
OF
LA GRANGE PARK, ILLINOIS**

Notice is hereby given that on August 26, 2020, a public hearing will be held before the Planning & Zoning Commission of La Grange Park, Illinois, in the Village Hall at 447 North Catherine Avenue, at 7:00 p.m. or soon thereafter for the purpose of considering an application for a special use permit and zoning variations on property zoned as C-1 Commercial District located at 1117 E. 31st Street, La Grange Park, Illinois, and legally described as:

LOTS 233, 234, 235 AND 236 IN ELM TERRACE SUBDIVISION OF THE EAST HALF OF THE SOUTHEAST QUARTER (EXCEPT THE WEST 30 RODS THEREOF) IN SECTION 28, TOWNSHIP 39 NORTH, RANGE 12 EAST OF THE THIRD PRINCIPAL MERIDIAN, IN COOK COUNTY, ILLINOIS.

The petitioner is Michael Engel. The petitioner is requesting a special use permit for the expansion of the existing "motor vehicle service and repair, minor" use.

The petitioner is requesting variations from: (1) the required loading berth length; (2) the minimum required distance from an unenclosed loading berth to a residential property line; (3) the prohibition of parking spaces in the front yard; (4) the minimum required width of perimeter parking lot landscaping; and (5) the number of required parking lot islands. The variations are requested in order to facilitate two building additions and the reconfiguration of the existing parking field.

The Application for Zoning Variation and description of proposed use are available for examination during normal office hours at the La Grange Park Village Hall, 447 N. Catherine Avenue, La Grange Park, Illinois.

All interested persons are invited and welcome to attend the hearing. All persons interested in providing testimony at the hearing are welcome to do so.

**PLANNING & ZONING COMMISSION
VILLAGE OF LA GRANGE PARK**

Eric Boyd, Chairman

Planning & Zoning Commission Agenda Memo

Date: August 26, 2020

To: Chairman Boyd and Members of the Planning & Zoning Commission

From: Emily Rodman, Assistant Village Manager

RE: **T-Mobile Wireless Antenna Facility, 937 Barnsdale Road – Site Plan Review**

GENERAL BACKGROUND

The Village has received an application from Insite RE, Inc. an authorized agent of T-Mobile Central, LLC, for Site Plan Review to upgrade its equipment on property located at 937 Barnsdale Road. The Applicant is requesting to replace the six antennas currently located on the tower, remove some of the existing ground equipment and install two new ground cabinets and associated cabling. The proposed ground equipment will be contained within the existing concrete pad leased by T-Mobile. The leased area located at the base of the water tower is surrounded by a chain link fence and existing landscaping.

Section 153.177 of the Village's Zoning Ordinance provide that wireless telecommunications antennas which qualify as "stealth design" are considered a permitted use subject only to site plan review.

ANALYSIS

Section 153.177 of the Zoning Ordinance lists three sets of requirements that must be met in order for antennas to qualify as "stealth designs."

1. **Wireless telecommunications antennas must be enclosed, camouflaged, screened, obscured or otherwise not readily apparent to a casual observer.** The proposed antennas will replace existing antennas mounted on the water tank and will be similar in size and color as the existing antennas, thus making the antennas not readily visible from the ground.
2. **Antennas must be located on structures already permitted within zoning districts, such as water towers, clock towers, streetlights, penthouses, parapet walls and steeples, and shall be designed to blend in to the structure. Antennas that co-locate on existing telecommunications towers shall also be considered stealth design. However, antennas attached to existing communication towers shall not increase the height of tower above the maximum allowed.** The proposed antennas will replace existing equipment currently located on the water tower where other equipment is co-located.
3. **No antenna shall increase the overall height of any building or structure on which it is mounted. If an antenna exceeds the overall height of any building or structure, it shall be a special use.** The proposed antennas will be mounted on the existing antenna support structures affixed to the water tower. The new equipment will not exceed the height of the water tower.

Section 153.177 of the Zoning Code lists elements of Wireless Telecommunications Antenna that should be addressed. They are:

1. **A site plan showing the location, size, screening and design of all buildings and structures, including fences.** Plans have been provided depicting the location of all existing and proposed equipment. The proposed antennas will be mounted in the same location as the current antennas. The proposed ground equipment will be located within the existing leased area footprint on the existing concrete pad. The water tower and support equipment is surrounded by a fence with a secured gate where access is restricted.
2. **The location and size of all outdoor equipment.** The proposed antennas will replace existing antennas. The dimensions and weight are as follows:

Existing:	(3)	82.0”h x 15.0”w	62 lbs.
	(3)	97.0”h x 12.0” w	49.6 lbs.
Proposed:	(6)	95.9”h x 25.2”w	127 lbs.
3. **A landscape plan showing all screening.** The existing screening will remain, which includes the existing chain link fencing around the facility and existing landscaping. No new screening is proposed.
4. **A maintenance plan, and any applicable maintenance agreement designed to ensure long-term, continuous maintenance to a reasonably prudent standard, including the maintenance of landscaping, keeping the area free from debris and litter and removal of any graffiti.** The Applicant’s lease agreement requires that the Applicant maintain all facilities.
5. **A disclosure of what is proposed, demonstrating the need for wireless telecommunications antennae, facility or tower to be located where proposed.** The equipment owned by this Applicant at this location is existing. The Applicant is upgrading the equipment with a newer model that will improve wireless service, increase network capacity, provide increased coverage and provide higher data speeds to facilitate faster uploads and downloads.
6. **The reason or purpose for the placement, construction or modification, with specific reference to the provider’s coverage, capacity and/or quality needs, goals objectives.** The Applicant’s equipment at this location is existing. The Applicant is upgrading the equipment with a newer model with the intent to improve service to the area and provide increased network capacity and service coverage. Under the terms of the applicant’s lease, they are permitted to maintain, replace and add equipment to facilitate the operation of their communications system.
7. **An EME/RF Study which documents both the individual carrier’s contribution of radiofrequencies (RF) to the environment, and the cumulative effects of all RF sources**

on the site. The study must document where the “maximum permissible exposure (MPE) is exceeded. The Applicant submitted this study with their previous upgrade to equipment. A new study has not been provided at this time.

8. **Certification by a State of Illinois licensed and registered professional engineer regarding the manner in which the proposed structure will fail. This certification may be utilized along with other criteria such as applicable regulations for the district in question, in determining if additional setback should be required for the facilities.** The Applicant has provided a Structural Assessment from KCS Corporation, along with a detailed analysis, which states that the existing water tank and cement slab are adequate to support the proposed change in equipment. The Village’s consulting engineer, Hancock Engineering, has also reviewed the analysis and concurs with its findings.
9. **A visual simulation or rendering of the proposed support structure that illustrates the relationship between the height and the visual appearance of the structure. The Village may require the visual simulation shall be provided from two (2) different perspectives and accurately depict the scale of the proposed structure in the context of the surrounding area.** The Applicant has not provided visual renderings at this time, as the equipment is replacing existing equipment and aesthetically will be similar to the existing equipment.

Should the PZC grant Site Plan Approval, the Applicant will be required to obtain building permits prior to installation of the equipment on the water tower.

RECOMMENDATION

Because the antenna and ancillary equipment are not readily visible and are currently co-located on/adjacent to the water tower with other equipment, staff believes that the equipment installation qualifies as stealth design. Therefore, staff recommends the Planning & Zoning Commission make a grant the requested site plan approval.

Motion to grant Site Plan Approval for T-Mobile in accordance with the T-Mobile Improvement Plans, Project Site CH4254B Plans, dated June 24, 2020 and consisting of seventeen (17) pages.

DOCUMENTATION

- Letter from Hancock Engineering dated August 5, 2020
 - Site Plan Application & Supporting Documents
- C: Mike Howley - Authorized Agent for T-Mobile, Insite RE, Inc.
Dean Maggos, Director of Fire and Building
Patrick Boyle, Building Official
Cathleen Keating, Village Attorney

August 5, 2020

Ms. Emily Rodman, AICP
Assistant Village Manager
Village of LaGrange Park
447 N. Catherine Avenue
LaGrange Park, IL 60526

Re: T-Mobile Antenna Modification
Swapping of Existing Antenna Equipment - 937 Barnsdale Road
Zoning Review
520-20-17170

Dear Ms. Rodman:

At your direction, our office has reviewed the materials provided by the Village for the above referenced project. The six (6) antennas installed on the legs of the water tank will be replaced with new units. Cabinets and equipment located within the fenced leased area at the base of the tank will also be upgraded. Based upon our review we offer the following comment:

- There are no engineering considerations that would inhibit the installation of the subject antennas at the proposed location or be in conflict with zoning regulations. They also provided supporting structural loading analysis for the new equipment.

If you should have any questions or concerns, please contact our office at your earliest convenience.

Sincerely,

EDWIN HANCOCK ENGINEERING CO.



Mark W. Volk, P.E.
Principal

Agent for T-Mobile: Mike Howley
Date: July 29, 2020
Site Address: 937 Barnsdale Road, LaGrange Park, IL 60526

Dear Ms. Rodman:

Re: Eligible Facilities Request to Modify Transmission Equipment at an Existing Base Station located at 937 Barnsdale Road, LaGrange Park, IL. 60526.

A. T-Mobile is Filing an Eligible Facilities Request

Insite RE, Inc., authorized agent on behalf of T-Mobile Central LLC, is submitting the attached Eligible Facilities Request application to add, remove, modify, or replace Transmission Equipment at an Existing Base Station located at 937 Barnsdale Road, LaGrange Park, IL 60526.

Because this jurisdiction has not yet developed an Eligible Facilities Request permit application form that complies with Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012, commonly known as the "Spectrum Act" (Pub. Law No. 112-96, 126 Stat 156) (codified at 47 U.S.C. § 1455), this Eligible Facilities Request is attached to the Application for Site Plan Review permit application form which was customarily used by this jurisdiction when reviewing requests to collocate or modify wireless telecommunications facilities. Because federal law now preempts many of the permit application requirements that this jurisdiction would previously have required from an applicant, this Eligible Facilities Request application provides only the information that federal law allows this jurisdiction to consider when reviewing an Eligible Facilities Request.

Section 6409(a) of the Spectrum Act mandates that state and local governments "*may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station.*" Under Section 6409(a)(2)(A)-(C) an Eligible Facilities Request is any request to modify a Tower or Base Station that involves "collocations of new Transmission Equipment," "removal," or "replacement" of Transmission Equipment.

B. Why this Eligible Facilities Request Must Be Granted

This Eligible Facilities Request involves an effort to collocate, remove, modify, or replace Transmission Equipment at an existing Base Station operated by an FCC licensed wireless carrier. The FCC has defined Base Station as "the equipment and non-tower supporting structure at a fixed location that enable Commission-licensed or authorized wireless communications between user equipment and a communications network . . . the term includes equipment associated with wireless communications service including, but not limited to, radio transceivers, antennas, coaxial or fiber-optic cable, regular and backup power supply, and comparable equipment." The term existing base station also includes a structure that currently houses or

supports an antenna, transceiver or other associated equipment that constitutes part of a Base Station at the time the application is filed even if the structure was not built solely or primarily to provide such support. The existing Base Station in this application is 133 feet high and presently contains wireless facilities. The existing Base Station meets the Federal Communications Commission (“FCC”) definition of a Base Station.

The list of equipment identified in the Eligible Facilities Request application that will be collocated, removed, or replaced at the Base Station also is Transmission Equipment as determined by the FCC. The FCC has defined Transmission Equipment as “any equipment that facilitates transmission for any Commission-licensed or authorized wireless communication service, including, but not limited to, radio transceivers, antennas and other relevant equipment associated with and necessary to their operation, including coaxial or fiber-optic cable, and regular and back-up power supply. This definition includes equipment used in any technological configuration associated with any Commission-authorized wireless transmission, licensed or unlicensed, terrestrial or satellite, including commercial mobile, private mobile, broadcast and public safety services, as well as fixed wireless services such as microwave backhaul or fixed broadband.”

The FCC, in a Report and Order adopted on October 17, 2014, determined that any modification to an existing telecommunications Base Station that meets the following six criteria does not substantially change the physical dimensions of the existing Base Station and therefore is an Eligible Facilities Request which must be granted:

1. The modifications to the Transmission Equipment do not increase the height of the Base Station by more than 10 percent (10%) or ten (10) feet, whichever is greater.
2. The modifications to the Transmission Equipment do not protrude from the edge of the support structure by more than six (6) feet.
3. The modifications to the Transmission Equipment do not involve the installation of more than the standard number of equipment cabinets for the technology involved, not to exceed four.
4. The modifications to the Transmission Equipment do not entail any excavation or deployment outside of the Base Station site.
5. The modifications to the Transmission Equipment do not defeat any existing concealed or stealth-design.
6. The modifications to the Transmission Equipment comply with prior conditions of approval of the Base Station, unless the non-compliance is due to an increase in height, increase in width, addition of equipment cabinets, or new excavation that does not exceed the corresponding “substantial change” thresholds in numbers 1-4.

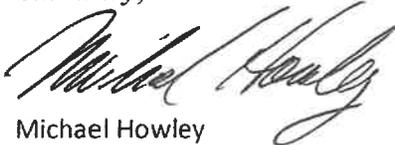
There is a certification attached to the accompanying Eligible Facilities Request that identifies how each of the six review criteria identified by the FCC is met. The modifications to the Transmission Equipment at the Base Station located at 937 Barnsdale Road, LaGrange Park, IL 60526 contained in this Eligible Facilities Request fully conform to Section 6409(a) as enacted by Congress and as interpreted by the FCC. Accordingly, this Eligible Facilities Request must be approved within 60 days, as required by federal law and FCC implementing regulations.

C. Notice of Federal Law Expedited Permit Processing and Deemed Granted

Under federal law, an Eligible Facilities Request is deemed granted sixty (60) days after a complete application is filed with a local jurisdiction. If sixty days pass after the submission of T-Mobile's accompanying Eligible Facilities Request and the Village of LaGrange Park has not acted to grant or deny the request, it will be deemed granted. At that time, the applicant may advise the Village of LaGrange Park that the application has been deemed granted. If the Village of LaGrange Park wishes to contest whether the Eligible Facilities Request has been deemed granted, the burden is on the Village of LaGrange Park to file a lawsuit in a court of competent jurisdiction within 30 days after receipt of a written communication notifying it that the Eligible Facilities Request has been deemed granted. Failure to file a lawsuit in a timely manner may forever bar this jurisdiction from contesting that this Eligible Facilities Request has been deemed granted.

T-Mobile is committed to working cooperatively with you, and all jurisdictions around the country, to secure expeditious approval of requests to modify existing personal wireless service facilities. Please do not hesitate to contact me if you have questions.

Sincerely,



Michael Howley
Authorized Agent of T-Mobile
15660 Midwest Road
Oakbrook Terrace, IL 60181
howley@insite-inc.com
630/240-3253

Eligible Facilities Request (EFR) Application Form

Date of Submittal: July 29, 2020

Submitted by:

Name: Mike Howley

Title: Authorized Agent for T-Mobile

Contact information: howley@insite-inc.com; cell 630/240-3253

Name of Jurisdiction: Village of LaGrange Park

Address of Jurisdiction: 447 N. Catherine, LaGrange Park, IL 60526

Contact Name for Jurisdiction: Emily Rodman, Assistant Village Manager

Name of Local Government Permit Application: Site Plan Review Application

Local Government File #: TBD, Not provided

Street Address of Site: 937 Barnsdale Road, LaGrange Park, IL 60526

Tax Parcel # of Site: 15-33-213-034-0000

Latitude/Longitude of Site: 41 49 55.10 -87 51 56.10

List Each Piece of Transmission Equipment that will be Collocated or Added:

Installation of 3 Octo antennas and 3 AAHF MIMO antennas, 6 RRUs and 3 breakout boxes (details on 6/24/20 construction drawings prepared by KCS Corporation Consulting Engineers)

List Each Piece of Transmission Equipment that will be Removed:

Removal of 6 existing antennas, RRUs and cables (details on 6/24/20 construction drawings prepared by KCS Corporation Consulting Engineers)

List Cabinets that will be Collocated or Added at the Site:

Installation of 2 Delta Gen 3 cabinets (SSC and BBU) and installation of 2 bottom OVPs (details on Page C-2 of 6/24/20 construction drawings prepared by KCS Corporation Consulting Engineers)

List Cabinets that will be Removed at the Site:

3FRBGs, Jager Cube, SSC, BTS Plinth (details on Page C-2 of 6/24/20 construction drawings prepared by KCS Corporation Consulting Engineers)

Permit Application Deposit Amount: \$500 application fee; \$1,000 reimbursement of fees deposit

Municipal Consultant Review Fee Deposit (if applicable): N/A



APPLICATION FOR SITE PLAN REVIEW

ADDRESS OF SUBJECT PROPERTY: _____

NAME OF APPLICANT(S): _____

INTEREST IN PROPERTY: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF PROPERTY OWNER/TRUSTEE(S): _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ATTORNEY (IF APPLICABLE): _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ENGINEER (IF APPLICABLE): _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NAME OF ARCHITECT (IF APPLICABLE): _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

VILLAGE PERSONAL: Provide the following information for any officer or employee of the Village with an interest in the Owner, Applicant, Consultant or the Subject Property and the nature and extent of that interest.

NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

EMAIL: _____ PHONE: _____ FAX: _____

NATURE/EXTENT OF INTEREST: _____



PERMANENT INDEX NUMBER OF SUBJECT PROPERTY (TAX ID NO.): _____

CURRENT ZONING CLASSIFICATION: _____

ADJACENT ZONING CLASSIFICATION:

NORTH: _____

SOUTH: _____

EAST: _____

WEST: _____

REQUIRED DOCUMENTATION: All required documents must be submitted in hard copy (2 copies) and in digital form (1 copy).

- STATEMENT OF AGREEMENT TO REIMBURSE COSTS (separate document)
- PROOF OF OWNERSHIP (current title policy report or deed and current title search)
- LEGAL DESCRIPTION
- PLAT OF SURVEY (certified by registered land surveyor)
- SITE PLAN (see description below)
- LANDSCAPE PLAN

SITE PLAN: Submit with this application a Site Plan, certified by a registered architect or land surveyor, showing:

- Accurate lot lines and dimensions of the Subject Property, all principal and accessory structures currently located on or proposed to be constructed on the Subject Property.
- Distances between structures and lot lines, distances between all principal and accessory structures.
- A vehicular and pedestrian circulation plan showing the location, dimensions, gradient, and number of all vehicular and pedestrian circulation elements including rights-of-way and streets; driveway entrances, curbs, and curb cuts; number, location and total count of parking spaces (regular and handicapped) and loading spaces, circulation aisles; sidewalks, walkways, and pathways; total lot coverage of all circulation elements divided as between vehicular and pedestrian ways. Submit with the Site Plan a detailed Statement of Property Uses (listing all activities and uses which will occur on the Subject Property) together with a calculation of the number of parking and loading spaces required for all uses of the Subject Property.
- Total open space and total impervious surface.
- All existing and proposed surface and subsurface drainage and retention and detention facilities and all existing and proposed water, sewer, gas, electric, telephone, and cable communications lines and easements and all other utility facilities.
- Location, size, and arrangement of all outdoor signs and lighting.
- Location and height of fences or screen plantings and the type or kind of building materials or plantings to be used for fencing or screening.
- A detailed landscaping plan showing location, size, and species of all trees, shrubs, and other plant material.
- Any other items specifically required by the Zoning Code or the ordinance approving a specific development.



STANDARDS FOR SITE PLAN REVIEW: In reviewing site plans, the relationship of the site plan to existing zoning regulations, conditions imposed upon the Subject Property by specific ordinance, adopted land use policies and the goals and objectives of the Comprehensive Plan shall be evaluated. In addition, the following characteristics shall also be evaluated.

1. Degree of conformity with existing standards.
2. Regulations of the Zoning Code and any other applicable regulations within the Village's Municipal Code, and the goals and policies of the Comprehensive Plan.
3. The location, arrangement, size, design and general site compatibility of buildings, light and signs, including:
 - a. Efficient use of land that responds to existing off-site utilities and service conditions in order to minimize the demand for additional municipal services, utilities and infrastructure.
 - b. Compatibility with, and mitigation of, any potential impact upon adjacent properties.
 - c. Site illumination designed and installed to minimize adverse impact on adjacent properties.
 - d. Signs which comply with Section 15 of the Zoning Code.
4. Landscaping and the arrangement of open space or natural features on the site should:
 - a. Create a desirable and functional environment for motorists, pedestrians, bicyclists and occupants of residential dwellings, business owners and employees. To achieve such an environment, landscaping may take advantage of open space design features such as bike paths, running paths and outdoor relaxation areas.
 - b. Preserve unique natural resources, including measures to preserve and protect existing healthy, mature trees.
 - c. Protect natural resources and landscaping on adjacent sites.
 - d. Design drainage facilities to promote the use and preservation of natural watercourses and patterns of drainage.
 - e. Utilize plant materials suitable to withstand the climatic conditions of the Village and microclimate of the site. The use of species native to northeastern Illinois is encouraged.
 - f. Use of screening to buffer the impact of the development on adjacent uses and enhance the appearance and image of the Village by screening incompatible uses and certain site elements, and creating a logical transition to adjoining lots and developments.
5. Circulation systems and off-street parking shall be designed to:
 - a. Provide adequate and safe access to the site for motor vehicles as well as alternate modes of transportation, including pedestrians and bicyclists.
 - b. Minimize potentially dangerous traffic movements.
 - c. Separate pedestrian and auto circulation and provide for bicycle parking or storage insofar as practical.
 - d. Minimize curb cuts by using cross-access easements and shared parking.
 - e. Design off-street parking lots or garages to minimize adverse impacts on adjacent properties, particularly through the use of perimeter and interior landscaping, promote logical and safe parking and internal circulation.
 - f. Clearly define pedestrian access from the parking area to the building(s). A clearly defined visible and identifiable network of pedestrian connections should be provided in and between parking lots, street sidewalks, open spaces and buildings.



OWNER/APPLICANT REPRESENTATIONS:

The Owner states that he and/or she consent to the filing of this application and that all information contained herein is true and correct to the best of his and/or her knowledge.

Name of Owner (print): _____ **Date:** _____

Signature of Owner: _____ **Date:** _____

The applicant certifies that all of the information contained in this application is correct to the best of applicant's knowledge. The applicant understands that an incomplete or nonconforming application will not be considered. In addition, the applicant understands that the Village may require additional information prior to the consideration of this application.

Name of Applicant (print): _____ **Date:** _____

Signature of Applicant: _____ **Date:** _____

APPLICATION FEE

An application fee of \$500.00, payable to the Village of La Grange Park, must accompany this Application.

REIMBURSEMENT OF FEES REQUIRED DEPOSIT AMOUNT

A deposit in the amount of \$1,000.00, payable to the Village of La Grange Park, must accompany this Application and the executed Reimbursement of Fees Agreement.

Revised July 2013

**ELIGIBLE FACILITIES REQUEST CERTIFICATION FOR NON-SUBSTANTIAL
CHANGES
TO A WIRELESS TOWER NOT LOCATED WITHIN A PUBLIC RIGHT OF WAY**

- 1) Address of the Wireless Tower: 937 Barnsdale Road, LaGrange Park, Illinois
- 2) The height (measured in feet above ground level) of the existing Tower as originally approved, including any modifications approved prior to February 22, 2012: 133' water tank
- 3) What is the height (measured in feet above ground level) at which the modifications to the Transmission Equipment will occur on the Tower? 100' antennae centerline
4. What will be the height (measured in feet above ground level) of the existing Tower after the modifications to the Transmission Equipment are installed? 133'
- 5) Effect of modifications of Transmission Equipment on Tower height:
- (A) Will the modifications in Transmission Equipment (addition, removal or replacement of Transmission Equipment) result in increasing the height above ground level of the existing Tower?
 Yes No
- (B) Will the modifications in Transmission Equipment result in increasing the height above ground level of the existing Tower by more than: (i) 10% of the height of the existing Tower, as originally approved, including any modifications approved prior to February 22, 2012; or (ii) twenty feet above the height of the existing Tower, as originally approved, including any modifications approved prior to February 22, 2012, whichever height increase is greater?
 Yes No
- 6) Will the modifications in Transmission Equipment (measured at the height above ground level where the Transmission Equipment will be attached to the tower) result in any Transmission Equipment protruding horizontally from the edge of tower by more than twenty (20) feet or by more than the existing width of the tower at that height, whichever of these dimensions is greater?
 Yes No
- 7) Will the proposed changes in Transmission Equipment involve excavation or placement of new equipment outside the existing Tower site or outside any access or utility easements currently related to the site?
 Yes No
- 8) Will the proposed modification in Transmission Equipment involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four?
 Yes No

9) Will the proposed modification in Transmission Equipment defeat the existing concealment elements of the Tower?

Yes No

(10) Prior Conditions of Approval

(A) Will the proposed modification in Transmission Equipment comply with conditions of approval imposed on the Tower prior to February 22, 2012?

Yes No

(B) If the answer to 10(A) is "No," is the non-compliance due solely to any of the conditions addressed in questions 5-9 above?

Yes No

If the answer to either question 5A or 5B is "No", and the answers to questions 6-9 are "No", and the answer to either 10A or B is "Yes" then the proposed modifications do not substantially change the physical dimensions of the existing Tower. Please provide a brief explanation, if necessary, to clarify any answer.

Explanatory Comments (If Needed):

Question No. _____

Comment:

This certification is dated this 29th day of July, 2020.



Signature

Mike Howley, Authorized Agent for T-Mobile, Insite RE, Inc. _____

Name & Title



VILLAGE OF LA GRANGE PARK • BUILDING DEPARTMENT

447 N. CATHERINE AVE, IL 60526 • PHONE (708) 354-0225 • FAX (708) 354-0241 • EMAIL BUILDING@LAGRANGEPARK.ORG

REIMBURSEMENT OF FEES AGREEMENT

Requires signature of both owner and applicant for submittal

Required Deposit Paid by and reimbursement to (check only one): Owner Applicant
Any remaining funds will be reimbursed only after final inspection approval

I. OWNER:

- A. Owner of Property: VILLAGE OF LA GRANGE PARK
- B. Owner's Address: 447 N. CATHERINE
- C. Phone No: 708/354-0225 Fax 708/354-0241 Email: ERodman@LAGRANGEPARK.ORG
- D. If Owner is a Land Trust, the names and addresses of the beneficiaries of the Trust or agent representing the Trust:

II. PERSON MAKING REQUEST (Applicant):

- A. Name of Applicant: T-MOBILE CENTRAL LLC
- B. Address: 1400 OPUS DRIVE, DAWSONS GRAVE, IL 60515
- C. Phone No: 630/240-3253 Fax N/A Email: Handley@1usite-inc.com

III. LOCATION OF PROPERTY:

- A. Project Address: 937 BARNSDALE ROAD

IV. REIMBURSEMENT OF FEES:

Should the Village, in its sole and exclusive discretion, determine that it is necessary or desirable for the Village to obtain professional services, including, but not limited to, attorneys, engineers, planners, architects, surveyors, traffic, drainage or other consultants, in connection with any Application filed by the Applicant, or to incur recordation, inspection, re-inspection, or other out of pocket costs or expenses in connection with any Application filed by the Applicant, then the Applicant and Owner shall be jointly and severally liable for the payment of such professional services fees and out of pocket costs as are actually incurred by the Village.

Upon the failure of the Applicant or Owner to reimburse the Village for fees or costs incurred in accordance with this Agreement, no further action shall be undertaken on any Application by the Village Staff, or Board of Trustees, or by any other official or quasi-official individual or body thereunder, including the conduct of any hearings or deliberations, the granting of any relief or approvals, inspections of work in progress, or the execution or recording of any documents, until all such outstanding fees are paid in full. Further, the Village may deny any application for any subsequent building or other permit pertaining to the same property until such amounts are paid in full.

The remedies available to the Village as set forth hereinabove are non-exclusive and nothing herein shall be deemed to limit or waive the Village's right to seek relief of such fees against any or all responsible parties in a court of competent jurisdiction.

Phone (708) 354-0225
 Fax (708) 354-0241
 Email building@lagrangepark.org

Village of La Grange Park
 Building Permit Application
 Payment required upon submittal

447 N Catherine Avenue
 La Grange Park, IL 60526
www.lagrangepark.org

Owner VILLAGE OF LA GRANGE PARK Phone # 708/354-0225
 Project Address 937 BARNSDALE ROAD Date Applied For 7/29/20
 Describe Work MODIFICATION TO EXISTING WIRELESS FACILITY Square Feet 300
 Construction Costs \$ 25,000 Reimbursement of Fees Agreement Required? Yes No

Homeowner Project Notification to: Contractor Homeowner Howie@lagrangepark.org

Contractor Type/ Name	Address	Phone #	L	B
General/Other <u>VELEX</u>	<u>2595 N. DALLAS PARKWAY, STE 300</u> <u>FRISCO, TX 75034</u>	<u>972/204-5833</u>		
Carpenter				
Plumber				
Electrician <u>VELEX</u>	<u>SAME AS ABOVE</u>	<u>"</u>		
HVAC				
Roofer				
Sewer				
Brick Mason				
Concrete				
Paving				
Excavator				
Architect				

By signing this application I acknowledge that I am either owner of said property or have the authorization of the owner for the performance of scope of work applied for.

[Signature]
 Property Owner/Authorized Agent

7/29/20
 Date

Office Use Only - Below This Line

Fee Detail Code Stop Fine included

Plan Review _____
 Engineering _____

 Electric _____
 Plumbing/Sewer _____
 HVAC/Boiler/Water Heater _____
 Demolition _____
 Occupancy _____
 License # _____
 Rules Sign _____
 Water Tap _____
 Meter & Connection _____
 Water Use _____
 Sewer Tap _____
 Street/Parkway Opening _____
 Deposit* _____
 Site Management _____
 Total Permit Cost _____

Approved By:

Building Department - Village of La Grange Park

Notification to: contractor homeowner
 Via: phone email fax mail

Status: not approved - resubmittal required

Date _____ By _____

approved - pending contractor info/registration
 approved - ready for issuance

Date _____ By _____

Comments _____

Issued By _____

Permit # _____

* requires submittal of Reimbursement of Fees Agreement



Structural Analysis of Existing Antenna Mount & Existing Water Tower

CH42545B – La Grange Park Water Tank
937 Barnsdale Rd.,
La Grange Park, IL 60526

Date Prepared: 06/23/2020



1125 Remington Rd.,
Schaumburg, IL 60173



CALCULATION COVER SHEET

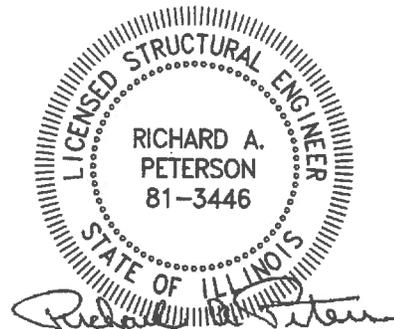
CLIENT: T-Mobile CALC. No. 0
 PROJECT: La Grange Park Water Tank REVISION 0 DATE 06/23/2020
 PROJECT No.: CH42545B

Designed By: FC
 Reviewed By: RP

TITLE: Structural Analysis of Existing Antenna Mount & Existing Water Tower

CONTENTS:

Ser. No.	Description	Rev. (0)	Page No.
1	Introduction, Codes & Standards, Design Criteria, References Appurtenance Loading Schedule, Summary		1
2	Loading Calculations		2-6
3	Water Tank & Balcony Handrail Analysis		7-30
4	Antenna Mount Check		33-37
APPENDIX			
A	Reference Drawings		A1-A2
B	T-Mobile Equipment Specification Sheets		B1-B9



Distribution:
Original to Project File

Signature: _____
 Date: 6/24/2020
 License No.: 81-3446
 Expires: 11/30/2020

MULTI-LEG WATER TOWER ANALYSIS

SITE ADDRESS: 937 Barnsdale Rd., La Grange Park, IL 60526
SITE NUMBER : CH42545B
SITE NAME: La Grange Park Water Tank
DESCRIPTION: Modification Site (Equipment Upgrade)

INTRODUCTION

T-Mobile proposes to install (6) antennas, (6) radio support units and (3) junction boxes/pendants on Antenna mounting pipes supported on the existing balcony handrail.

The purpose of this analysis is to determine if the antenna mount & water tank is structurally capable of supporting the proposed antenna installation in addition to the existing tank loads.

APPLICABLE CODES AND STANDARDS

- ANSI/AWWA-D100-05
- ANSI/TIA-222-G
- AISC 14th ed.

DESIGN CRITERIA

- Basic Wind Speed of 90 mph based on 3-sec gust wind speed w/o ice (AWWAD100-05)
- Exposure Category C (AWWAD100-05)
- Exposure Category C (ANSI/TIA-222-G)

REFERENCES

- 1- RFDS for T-Mobile proposed equipment dated 5/18/2020.
- 2 - T-Mobile construction drawings for upgrades in 2017 done by Concordia Wireless, Inc. dated 4/20/2017
- 3 - Structura analysis performed by Concordia Wireless, Inc. dated 4/20/2017.
- 4 - T-Mobile construction drawings for upgrades by KCS Corporation. dated 6/24/2020.

ANTENNA AND APPURTENANCE INFORMATION (ALL SECTORS)

APPURTENANCE DESCRIPTION	CL ELEVATION	QTY	HEIGHT (IN.)	WIDTH (IN.)	DEPTH (IN.)	UNIT WEIGHT (LBS.)
Commscope FFHH-65C-R3	100' AGL	3	95.9	25.2	9.3	127.6
AAHF Active Antenna Massive MIMO	100' AGL	3	25.6	19.7	10.3	103.6
AHLOA RRU	100' AGL	3	22.04	12.12	6.3	83.8
AHFIG RRU	100' AGL	3	28.7	12.9	5.6	70.5
BREAKOUT BOX/PENDANT	100' AGL	3	14	9.3	5	4.0

WATER TANK ANALYSIS SUMMARY

Wind loading analysis, stability analysis checks have been performed and results indicate that the existing water tower is **structurally capable** of supporting the proposed T-Mobile equipment upgrade installation on existing balcony handrail.

ANTENNA MOUNT ANALYSIS SUMMARY

The existing antenna mount member sizes were not available therefore minimum sizes required to support proposed antennas and supporting equipment were used to analyze the mount. All member sizes should be at least 2 7/8" O.D sch 40 pipes. Upgrade all existing antenna mount members as required. The antenna mount with minimum member sizes of 2 7/8" O.D sch 40 pipes was found to be adequate and capable of supporting proposed antennas and supporting equipment.

Calculating Wind Loads On Antennas (per ANSI/TIA-222-G)

T-Mobile Antennas @ CL. 100 ft. AGL

V := 90mph

Basic Wind Speed

α := 9.5 Z_g := 900ft

For exposure category "C"

Z_{ant} := 100ft

Above-ground height to center line of antenna

$$K_z := 2.01 \cdot \left(\frac{Z_{ant}}{Z_g} \right)^{\frac{2}{\alpha}} \quad K_z = 1.27$$

Velocity Pressure coefficient (Section 2.6.5.2)

K_{zt} := 1

Topographic factor, Section 2.6.6.2.1 (Category 1)

K_d := 0.85

Wind Directionality factor, Table 2-2

G_h := 0.85

Gus effect factor, Section 2.6.7

I_{factor} := 1.15

Importance factor, Table 2-3

$$q_{z_ant} := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I_{factor} \cdot G_h \cdot \frac{\text{psf}}{\text{mph}^2} = 21.81 \cdot \text{psf}$$

Velocity pressure

Antennas by others @ CL. 110 ft. AGL

V := 90mph

Basic Wind Speed

α := 9.5 Z_g := 900ft

For exposure category "C"

Z_{ant_others} := 110ft

Above-ground height to center line of antenna

$$K_z := 2.01 \cdot \left(\frac{Z_{ant_others}}{Z_g} \right)^{\frac{2}{\alpha}} \quad K_z = 1.29$$

Velocity Pressure coefficient (Section 2.6.5.2)

K_{zt} := 1

Topographic factor, Section 2.6.6.2.1 (Category 1)

K_d := 0.85

Wind Directionality factor, Table 2-2

G_h := 0.85

Gus effect factor, Section 2.6.7

I_{factor} := 1.15

Importance factor, Table 2-3

$$q_{z_other} := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I_{factor} \cdot G_h \cdot \frac{\text{psf}}{\text{mph}^2} = 22.25 \cdot \text{psf}$$

Velocity pressure

Proposed Telecom Equipment Wind Load Calculations For All sectors (per ANSI/TIA-222-G)

Antenna 1 - Commscope FFHH-65C-R3

$H_{ANT} := 95.9\text{in}$ $W_{ANT} := 25.2\text{in}$ $D_{ANT} := 9.3\text{in}$ $A_{A1} := H_{ANT} \cdot W_{ANT}$

$A_{A1} = 16.78\text{ft}^2$ Projected area of antenna (Front)

$A_{A1_S} := H_{ANT} \cdot D_{ANT} = 6.19\text{ft}^2$ Projected area of antenna (Side)

$C_{shape} := 1.26$ $C_{shape_S} := 1.51$ $W_{ANT1} := 127.6\text{lb}$ Antenna Weight

$EPA_{A1} := C_{shape} \cdot A_{A1}$ $EPA_{A1} = 21.1\text{ft}^2$ Effective projected area of antenna (Front)

$EPA_{A1_S} := C_{shape_S} \cdot A_{A1_S}$ $EPA_{A1_S} = 9.4\text{ft}^2$ Effective projected area of antenna (Side)

$F_{A1} := EPA_{A1} \cdot q_{z_ant}$ $F_{A1} = 461.1\text{lb}$ Force due to Wind on Antenna (Front)

$F_{A1_S} := EPA_{A1_S} \cdot q_{z_ant}$ $F_{A1_S} = 203.93\text{lb}$ Force due to Wind on Antenna (Side)

Antenna 2 - AAHF (Active Antenna - Massive MIMO)

$H_{ANT} := 25.6\text{in}$ $W_{ANT} := 19.7\text{in}$ $D_{ANT} := 10.3\text{in}$ $A_{A2} := H_{ANT} \cdot W_{ANT}$

$A_{A2} = 3.5\text{ft}^2$ Projected area of antenna (Front)

$A_{A2_S} := H_{ANT} \cdot D_{ANT} = 1.83\text{ft}^2$ Projected area of antenna (Side)

$C_{shape} := 1.20$ $C_{shape_S} := 1.2$ $W_{ANT2} := 103.6\text{lb}$ Antenna Weight

$EPA_{A2} := C_{shape} \cdot A_{A2}$ $EPA_{A2} = 4.2\text{ft}^2$ Effective projected area of antenna (Front)

$EPA_{A2_S} := C_{shape_S} \cdot A_{A2_S}$ $EPA_{A2_S} = 2.2\text{ft}^2$ Effective projected area of antenna (Side)

$F_{A2} := EPA_{A2} \cdot q_{z_ant}$ $F_{A2} = 91.64\text{lb}$ Force due to Wind on Antenna (Front)

$F_{A2_S} := EPA_{A2_S} \cdot q_{z_ant}$ $F_{A2_S} = 47.91\text{lb}$ Force due to Wind on Antenna (Side)

BREAKOUT BOX/PENDANT

$$H_{\text{BOB}} := 16.06\text{in} \quad W_{\text{BOB}} := 9.3\text{in} \quad D_{\text{BOB}} := 5.78\text{in}$$

$$A_{\text{BOB}} := H_{\text{BOB}} \cdot W_{\text{BOB}} = 1.04\text{ft}^2 \quad \text{Projected area of antenna (Front)}$$

$$A_{\text{BOB}_S} := H_{\text{BOB}} \cdot D_{\text{BOB}} = 0.64\text{ft}^2 \quad \text{Projected area of antenna (Side)}$$

$$C_{\text{shape}} := 1.2 \quad C_{\text{shape}_S} := 1.21 \quad W_{\text{BOB}_P} := 4\text{lb} \quad \text{Equipment Weight}$$

$$EPA_{\text{RRU}} := H_{\text{BOB}} \cdot W_{\text{BOB}} \cdot C_{\text{shape}} = 1.24\text{ft}^2 \quad \text{Effective projected area of BOB (Front)}$$

$$EPA_{\text{RRU}_S} := H_{\text{BOB}} \cdot D_{\text{BOB}} \cdot C_{\text{shape}_S} = 0.78\text{ft}^2 \quad \text{Effective projected area of BOB (Side)}$$

$$F_{\text{BOB}} := EPA_{\text{RRU}} \cdot q_{z_{\text{ant}}} = 27.14\text{lb} \quad \text{Force due to Wind on BOB (Front)}$$

$$F_{\text{BOB}_S} := EPA_{\text{RRU}_S} \cdot q_{z_{\text{ant}}} = 17.01\text{lb} \quad \text{Force due to Wind on BOB (Side)}$$

RRU 1 - AHLOA

$H_{RRU} := 22.04\text{in}$ $W_{RRU} := 12.12\text{in}$ $D_{RRU} := 7.44\text{in}$

$A_{RRU} := H_{RRU} \cdot W_{RRU} = 1.86\text{ft}^2$ Projected area of RRU (Front)

$A_{RRU_S} := H_{RRU} \cdot D_{RRU} = 1.14\text{ft}^2$ Projected area of RRU (Side)

$C_{shape} := 1.2$ $C_{shape_S} := 1.24$ $W_{RRU1} := 83.8\text{lb}$ RRU Weight

$EPA_{RRU1} := A_{RRU} \cdot C_{shape} = 2.23\text{ft}^2$ Effective projected area of RRU (Front)

$EPA_{RRU1_S} := A_{RRU_S} \cdot C_{shape_S} = 1.41\text{ft}^2$ Effective projected area of RRU (Side)

$F_{RRU1} := EPA_{RRU1} \cdot q_{z_ant} = 48.54\text{lb}$ Force due to Wind on RRU (Front)

$F_{RRU1_S} := EPA_{RRU1_S} \cdot q_{z_ant} = 30.79\text{lb}$ Force due to Wind on RRU (Side)

RRU 2 - AHFIG

$H_{RRU} := 28.7\text{in}$ $W_{RRU} := 12.9\text{in}$ $D_{RRU} := 5.6\text{in}$

$A_{RRU} := H_{RRU} \cdot W_{RRU} = 2.57\text{ft}^2$ Projected area of RRU (Front)

$A_{RRU_S} := H_{RRU} \cdot D_{RRU} = 1.12\text{ft}^2$ Projected area of RRU (Side)

$C_{shape} := 1.2$ $C_{shape_S} := 1.32$ $W_{RRU2} := 70.5\text{lb}$ RRU 2 Weight

$EPA_{RRU2} := A_{RRU} \cdot C_{shape} = 3.09\text{ft}^2$ Effective projected area of RRU (Front)

$F_{RRU2} := EPA_{RRU2} \cdot q_{z_ant}$ $F_{RRU2} = 67.28\text{lb}$ Force due to Wind on RRU (Front)

$EPA_{RRU2_S} := A_{RRU_S} \cdot C_{shape_S} = 1.47\text{ft}^2$ Effective projected area of RRU (Side)

$F_{RRU2_S} := EPA_{RRU2_S} \cdot q_{z_ant}$ $F_{RRU2_S} = 32.13\text{lb}$ Force due to Wind on RRU (Side)

STD 2 & 2.5 Pipe

$$L_{2.5} := 8.0\text{ft} \quad L_{2.0} := 6\text{ft} \quad C_{\text{shape}} := 1.2$$

$$W_{2.5_std} := 2.88\text{in} \quad W_{2.0_std} := 2.38\text{in}$$

$$w_{2.5_std} := 5.80 \frac{\text{lb}}{\text{ft}} \quad w_{2.0_std} := 3.66 \frac{\text{lb}}{\text{ft}}$$

$$EPA_{2.0_std} := L_{2.0} \cdot W_{2.0_std} \cdot C_{\text{shape}} = 1.43\text{ft}^2 \quad \text{Force due to wind on mounting pipes}$$

$$F_{2.0_std} := EPA_{2.0_std} \cdot q_{z_ant} = 31.14\text{lb}$$

$$EPA_{2.5_std} := L_{2.5} \cdot W_{2.5_std} \cdot C_{\text{shape}} = 2.3\text{ft}^2 \quad \text{Force due to wind on mounting pipes}$$

$$F_{2.5_std} := EPA_{2.5_std} \cdot q_{z_ant} = 50.24\text{lb}$$

Wind Force due to Telecom Equipment on Per Sector

$$F_{\text{normal}.1} := F_{A1} + F_{A2} + F_{RRU1} + F_{RRU2} + F_{BOB} + 2F_{2.0_std} + 2F_{2.5_std}$$

$$F_{\text{normal}.1} = 858.45\text{lb} \quad \text{Total Wind on Antenna Front (Normal)}$$

$$F_{\text{tangential}.1} := F_{A1_S} + F_{A2_S} + F_{RRU1_S} + F_{RRU2_S} + F_{BOB_S} + 2F_{2.0_std} + 2 \cdot F_{2.5_std}$$

$$F_{\text{tangential}.1} = 494.52\text{lb} \quad \text{Total Wind on Antenna Side (tangential)}$$

$$\alpha := 0\text{deg} \quad \text{Wind normal to antenna}$$

$$F_1 := F_{\text{normal}.1} \cdot \cos(\alpha) + F_{\text{tangential}.1} \cdot \sin(\alpha) = 858.45\text{lb}$$

Total Wind Force due to Telecom Equipment

$$A_{\text{total_front}} := (36\text{ft}^2 + 36\text{ft}^2 + 16.67\text{ft}^2) \cdot 1.5 = 133.01\text{ft}^2 \quad \text{Total equipment surface area by others w/ Ca=1.5 conserv. areas per reference #3.}$$

$$F_{\text{OTHERS}} := 1.5q_{z_other} \cdot A_{\text{total_front}} = 4.44 \cdot \text{kip} \quad \text{Wind force on water tank by equipment by others with 1.5 safety factor.}$$

$$F_{\text{TMO}} := 3F_1 = 2.58 \cdot \text{kip} \quad \text{TMO equipment total wind force on WT}$$

$$F_{\text{TOTAL}} := F_{\text{TMO}} + F_{\text{OTHERS}} = 7.01 \cdot \text{kip} \quad \text{Approx. Wind load on WT by all mounted equipment}$$

Weight due to Telecom Equipment

$$W_{\text{mount}.1} := 6 \cdot L_{2.0} \cdot W_{2.0_std} + 6 \cdot L_{2.5} \cdot W_{2.5_std} = 410.16\text{lb} \quad \text{Mounting Pipes (Antennas+RRUs)}$$

$$W_{\text{SECTOR}} := W_{\text{ANT1}} + W_{\text{ANT2}} + W_{\text{RRU1}} + W_{\text{RRU2}} + W_{\text{BOB_P}} \quad \text{Sector gravity load}$$

$$W_{\text{SECTOR}} = 389.5\text{lb}$$

$$W_{\text{TOTAL_TMO.}} := 3W_{\text{SECTOR}} + W_{\text{mount}.1} = 1578.66\text{lb} \quad \text{Total T-mobile equipment weight}$$

$$W_{\text{TOTAL_OTHERS}} := 4000\text{lb} \quad \text{Estimated weight of equipment by others}$$

$$W_{\text{TOTAL}} := W_{\text{TOTAL_TMO.}} + W_{\text{TOTAL_OTHERS}} = 5578.66\text{lb} \quad \text{Total weight of equipment on water tower}$$

Wind Loads on Water Tank (per AWWA100-05)

At WT Panel 3

$Z := 18.07\text{ft}$ $V := 90\text{mph}$

Height at Centroid &
 Basic Wind Speed

$K_z := 1.09$

For exposure category "C"

$I := 1.15$

Importance Factor per AWWA

$G_h := 1$

Gus Factor per AWWA

$C_{f_flat} := 1.0$ $C_{f_cyl} := 0.60$ $C_{f_sphere} := 0.50$

Force Coefficient (AWWA Table 2)

$q_z := 0.00256 \cdot K_z \cdot V^2 \cdot I \cdot \frac{\text{psf}}{\text{mph}^2} = 25.99 \cdot \text{psf}$

Per AWWA (Eq 3-1)

$P_w := q_z \cdot G_h \cdot C_{f_cyl} = 15.6 \cdot \text{psf}$

$P_{w_panel3} := \max(P_w, 30\text{psf} \cdot C_{f_cyl}) = 18 \cdot \text{psf}$

Velocity Pressure at Panel 3 Centroid

At WT Panel 2

$Z := 54.125\text{ft}$

Height at Centroid

$K_z := 1.11$

For exposure category "C"

$q_z := 0.00256 \cdot K_z \cdot V^2 \cdot I \cdot \frac{\text{psf}}{\text{mph}^2} = 26.47 \cdot \text{psf}$

$P_w := q_z \cdot G_h \cdot C_{f_cyl} = 15.88 \cdot \text{psf}$

Per AWWA (Eq 3-1)

$P_{w_panel2} := \max(P_w, 30\text{psf} \cdot C_{f_cyl}) = 18 \cdot \text{psf}$

Velocity Pressure at Panel 2 Centroid

$P_w := q_z \cdot G_h \cdot C_{f_flat} = 26.47 \cdot \text{psf}$

Per AWWA (Eq 3-1)

$P_{w_panel2_flat} := \max(P_w, 30\text{psf} \cdot C_{f_flat}) = 30 \cdot \text{psf}$

Velocity Pressure at Panel 2 flat
 members

At WT Panel 1

$$Z := 89.50\text{ft}$$

Height at Centroid

$$K_z := 1.23$$

For exposure category "C"

$$q_z := 0.00256 \cdot K_z \cdot V^2 \cdot I \cdot \frac{\text{psf}}{\text{mph}^2} = 29.33 \cdot \text{psf}$$

$$P_w := q_z \cdot G_h \cdot C_{f_cyl} = 17.6 \cdot \text{psf}$$

Per AWWA (Eq 3-1)

$$P_{w_panel1} := \max(P_w, 30\text{psf} \cdot C_{f_cyl}) = 18 \cdot \text{psf}$$

Velocity Pressure at Panel 1 Centroid

$$P_w := q_z \cdot G_h \cdot C_{f_flat} = 29.33 \cdot \text{psf}$$

Per AWWA (Eq 3-1)

$$P_{w_panel1_flat} := \max(P_w, 30\text{psf} \cdot C_{f_flat}) = 30 \cdot \text{psf}$$

Velocity Pressure at Panel 2 flat members

At WT Bowl

$$Z := 115\text{ft}$$

Height at Centroid

$$K_z := 1.30$$

For exposure category "C"

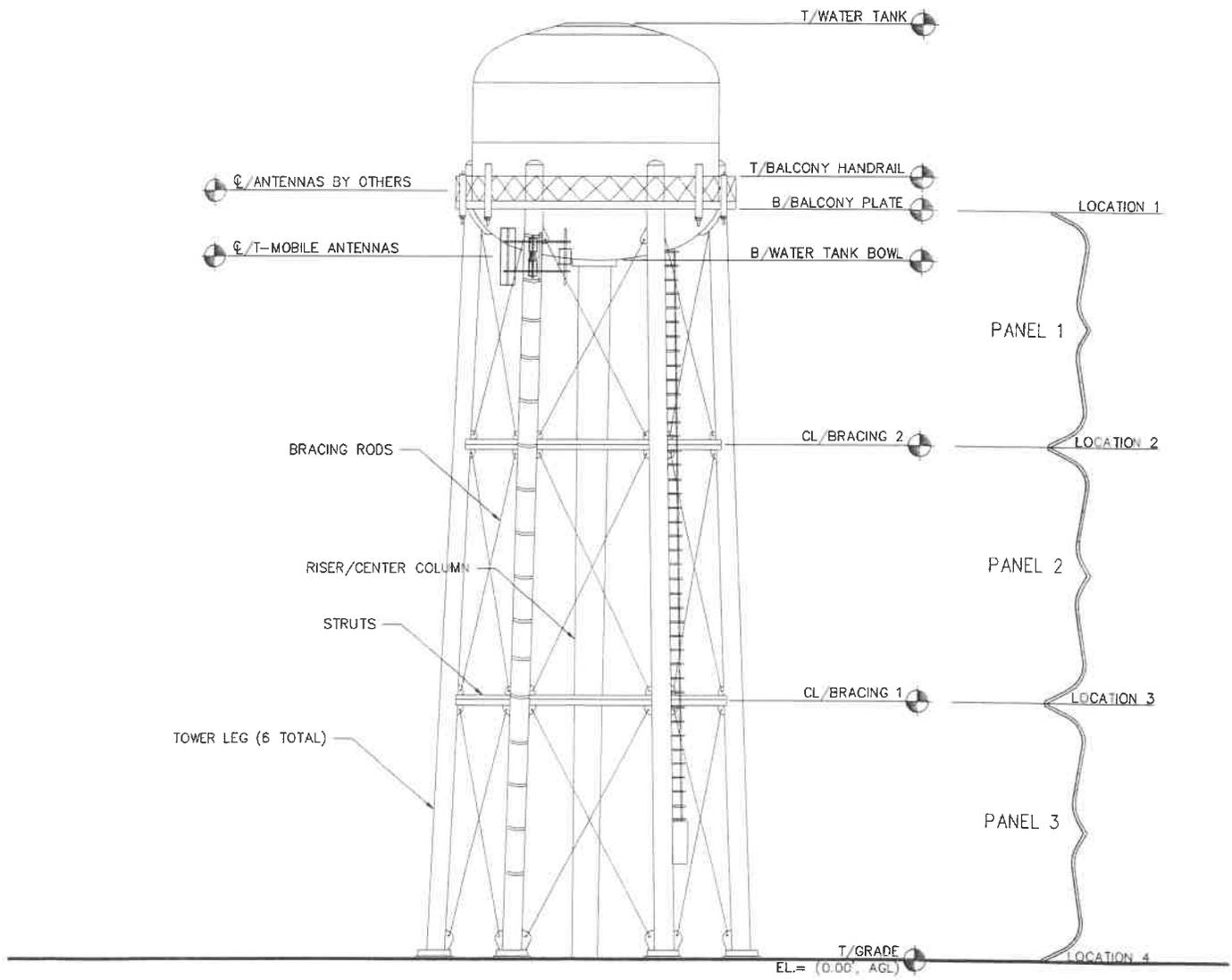
$$q_z := 0.00256 \cdot K_z \cdot V^2 \cdot I \cdot \frac{\text{psf}}{\text{mph}^2} = 31 \cdot \text{psf}$$

$$P_w := q_z \cdot G_h \cdot C_{f_cyl} = 18.6 \text{lb} \cdot \text{ft}^{-2}$$

Per AWWA (Eq 3-1)

$$P_{w_spheroid} := \max(P_w, 30\text{psf} \cdot C_{f_cyl}) = 18.6 \cdot \text{psf}$$

Velocity Pressure at Panel 1 Centroid



Water Tank Properties

$d_{\text{fnd}} := 48.90\text{ft}$	Foundation diameter
$d_{\text{tank}} := 40\text{ft}$	Tank diameter
$h_{\text{tank_top}} := 133\text{ft}$	Top of tank height
$h_{\text{tank_bottom}} := 97\text{ft}$	Bottom of tank height
$h_{\text{bowl}} := h_{\text{tank_top}} - h_{\text{tank_bottom}} = 36\text{ft}$	Tank bowl height
$h_{\text{lc}} := 107\text{ft}$	Height of tank legs
$N_{\text{leg}} := 6$	Number of tank legs
$N_{\text{panels}} := 3$	Number of panels
$d_{\text{lc}} := 30.5625\text{in}$	Tank leg outside diameter
$d_{\text{lc_in}} := 30.1875\text{in}$	Tank leg inside diameter assumed conserv.
$t_{\text{lc1}} := 0.375\text{in}$	Tank leg thickness assumed conserv.
$t_{\text{lc2}} := 0.375\text{in}$	Tank leg thickness assumed conserv.
$t_{\text{lc3}} := 0.375\text{in}$	Tank leg thickness assumed conserv.
$h_{\text{rc}} := h_{\text{tank_bottom}} = 97\text{ft}$	Riser col. height
$d_{\text{rc}} := 48.5\text{in}$	Riser column diameter
$t_{\text{rc}} := 0.375\text{in}$	Riser thickness assumed conservative
$d_{\text{r1}} := 1.375\text{in}$	Top panel rod diameter
$d_{\text{r2}} := 1.625\text{in}$	Center panel rod diameter
$d_{\text{r3}} := 1.75\text{in}$	Bottom panel rod diameter
$h_{\text{s2}} := 8\text{in}$	Center-Top panel strut height (W8x24) per ref. 3
$h_{\text{s3}} := 8\text{in}$	Center-Bottom panel strut height (W8x24) per ref. 3
$W_{\text{c}} := 39\text{kip}$	Foundation concrete weight per ref. 3
$W_{\text{e}} := 66\text{kip}$	Foundation earth weight per ref. 3
$n_{\text{bolt}} := 2$	Number of bolts per leg per ref. 3
$d_{\text{bolt}} := 1.75\text{in}$	Diameter of bolt per ref. 3
$W_{\text{w}} := 2085.42\text{kip}$	Tank water weight per ref. 3
$W_{\text{m}} := 208.54\text{kip}$	Total tank metal weight per ref. 3
$W_{\text{empty}} := W_{\text{m}} = 208.54 \cdot \text{kip}$	Weight of tank when empty
$W_{\text{EQ}} := W_{\text{TOTAL}} = 5.58 \cdot \text{kip}$	Total load on tank from equipment
$\gamma_{\text{m}} := 490\text{pcf}$	Unit weight of steel
$W_{\text{bowl}} := \left[W_{\text{m}} - 1N_{\text{leg}} \cdot (\pi d_{\text{lc}} \cdot t_{\text{lc1}}) \cdot \gamma_{\text{m}} \cdot h_{\text{lc}} \right] \dots = 111.02 \cdot \text{kip}$ $\quad + -(\pi d_{\text{rc}} \cdot t_{\text{rc}}) \cdot \gamma_{\text{m}} \cdot h_{\text{rc}}$	Water tank bowl weight
$W_{\text{col}} := W_{\text{m}} - W_{\text{bowl}} = 97.52 \cdot \text{kip}$	Support legs and riser metal weight

Wind Loads On Water Tank Components

$$A_{\text{bowl}} := 1206 \text{ft}^2$$

Tank bowl projected area (approximated)

$$y_{\text{bowl}} := h_{\text{tank_bottom}} + \frac{h_{\text{bowl}}}{2} = 115 \text{ft}$$

Tank bowl centroid

$$F_{\text{bowl}} := A_{\text{bowl}} \cdot P_{w_spheroid} = 22.43 \cdot \text{kip}$$

Wind force on water tank bowl

$$A_{\text{rc}} := d_{\text{rc}} = 4.04 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Riser col. projected area

$$F_{\text{rc}} := A_{\text{rc}} \cdot P_{w_panel2} = 72.75 \cdot \text{plf}$$

Average wind force on riser col.

$$A_{\text{lc}} := d_{\text{lc}} = 2.55 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Leg col. projected area

$$F_{\text{lc}} := A_{\text{lc}} \cdot P_{w_panel2} = 45.84 \cdot \text{plf}$$

Average wind force on leg col.

$$A_{\text{r1}} := d_{\text{r1}} = 0.11 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Rod projected area

$$F_{\text{r1}} := A_{\text{r1}} \cdot P_{w_panel1} = 2.06 \cdot \text{plf}$$

Wind force on rod

$$A_{\text{r2}} := d_{\text{r2}} = 0.14 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Rod projected area

$$F_{\text{r2}} := A_{\text{r2}} \cdot P_{w_panel2} = 2.44 \cdot \text{plf}$$

Wind force on rod

$$A_{\text{r3}} := d_{\text{r3}} = 0.15 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Rod projected area

$$F_{\text{r3}} := A_{\text{r3}} \cdot P_{w_panel3} = 2.63 \cdot \text{plf}$$

Wind force on rod

$$A_{\text{s2}} := h_{\text{s2}} = 0.67 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Strut projected area

$$F_{\text{s2}} := A_{\text{s2}} \cdot P_{w_panel2_flat} = 20 \cdot \text{plf}$$

Wind force on strut

$$A_{\text{s3}} := h_{\text{s3}} = 0.67 \cdot \frac{\text{ft}^2}{\text{ft}}$$

Strut projected area

$$F_{\text{s3}} := A_{\text{s3}} \cdot P_{w_panel2_flat} = 20 \cdot \text{plf}$$

Wind force on strut

$$A_{hr} := 1.5 \frac{\text{ft}^2}{\text{ft}} \quad \text{handrail projected area}$$

$$y_{hr} := h_{lc} + 1.5\text{ft} = 108.5\text{ft} \quad \text{Centroid of handrail}$$

$$F_{hr} := (d_{tank} + 5\text{ft}) \cdot A_{hr} \cdot P_{w_panel1_flat} = 2.03 \cdot \text{kip} \quad \text{Wind force on handrail}$$

Water Tank Geometry

$$\alpha_{leg} := \frac{360\text{deg}}{N_{leg}} = 60 \cdot \text{deg} \quad \text{Distance between legs at top}$$

$$\text{dist}_{leg1} := d_{tank} \cdot \sin\left(\frac{\alpha_{leg}}{2}\right) = 20\text{ft}$$

Panel length

$$L1 := 34.75\text{ft}$$

$$L2 := 35.97\text{ft}$$

$$L3 := 36.14\text{ft}$$

Diameter at Strut Locations

$$D_{p2} := \frac{L1 \cdot (d_{fnd} - d_{tank})}{h_{lc}} + d_{tank} = 42.89\text{ft} \quad \text{Diameter at strut between panel 1 and panel 2}$$

$$D_{p3} := \frac{(L1 + L2) \cdot (d_{fnd} - d_{tank})}{h_{lc}} + d_{tank} = 45.88\text{ft} \quad \text{Diameter at strut between panel 2 and panel 3}$$

$$D_{p4} := d_{fnd} = 48.9\text{ft} \quad \text{Diameter at base}$$

Leg Distance & Strut Lengths

$$LD_1 := \text{dist}_{leg1} = 20\text{ft} \quad LD_2 := D_{p2} \cdot \sin\left(\frac{\alpha_{leg}}{2}\right) = 21.45\text{ft} \quad \begin{array}{l} \text{Distance between legs at top /} \\ \text{Distance between legs at top Panel 2} \end{array}$$

$$LD_3 := D_{p3} \cdot \sin\left(\frac{\alpha_{leg}}{2}\right) = 22.94\text{ft} \quad LD_4 := D_{p4} \cdot \sin\left(\frac{\alpha_{leg}}{2}\right) = 24.45\text{ft} \quad \begin{array}{l} \text{Distance between legs at top of Panel 3 /} \\ \text{Distance between legs at foundation} \end{array}$$

Rod Angle

$$\theta_1 := \text{atan}\left[\frac{L1}{\frac{(LD_1 + LD_2)}{2}}\right] = 59.19 \cdot \text{deg} \quad \text{Rod Angle at panel 1}$$

$$\theta_2 := \text{atan}\left[\frac{L2}{\frac{(LD_2 + LD_3)}{2}}\right] = 58.33 \cdot \text{deg} \quad \text{Rod Angle at Panel 2}$$

$$\theta_3 := \text{atan}\left[\frac{L3}{\frac{(LD_3 + LD_4)}{2}}\right] = 56.75 \cdot \text{deg} \quad \text{Rod Angle at Panel 3}$$

Forces At Location 1

1. Bending Moment

$$h_{dis} := h_{lc}$$

$$M_{bowl} := F_{bowl} \cdot (y_{bowl} - h_{dis}) = 179.45 \cdot \text{kip} \cdot \text{ft}$$

Moment due to water tank bowl

$$M_{hr} := F_{hr} \cdot (y_{hr} - h_{dis}) = 3.04 \cdot \text{kip} \cdot \text{ft}$$

Moment due to handrail

$$M_{app} := F_{OTHERS} \cdot (Z_{ant_others} - h_{dis}) = 13.32 \cdot \text{kip} \cdot \text{ft}$$

Moment due to equipment

$$M_1 := M_{bowl} + M_{hr} = 182.49 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 1 without equipment

$$M_{1t} := M_1 + M_{app} = 195.81 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 1 with equipment

2. Shear Force

$$V_{bowl} := F_{bowl} = 22.43 \cdot \text{kip}$$

Wind load on water tank bowl

$$V_{hr} := F_{hr} = 2.03 \cdot \text{kip}$$

Wind load on handrail

$$V_{app} := F_{TMO} + F_{OTHERS} = 7.01 \cdot \text{kip}$$

Wind load on equipment

$$V_1 := V_{bowl} + V_{hr} = 24.46 \cdot \text{kip}$$

Wind load at Location 1 without equipment

$$V_{1t} := V_1 + V_{app} = 31.47 \cdot \text{kip}$$

Wind load at Location 1 with equipment

3. Axial Force

$$P_1 := W_w + W_{bowl} = 2196.44 \cdot \text{kip}$$

Axial Load at Location 1 without equipment

$$P_{1t} := P_1 + W_{TOTAL} = 2202.02 \cdot \text{kip}$$

Axial Load at Location 1 with equipment

Forces At Location 2

1. Bending Moment

$$h_{dis} := L2 + L3$$

$$M_{bowl} := F_{bowl} \cdot (y_{bowl} - h_{dis}) = 962.1 \cdot \text{kip} \cdot \text{ft}$$

Moment due to water tank bowl

$$M_{hr} := F_{hr} \cdot (y_{hr} - h_{dis}) = 73.69 \cdot \text{kip} \cdot \text{ft}$$

Moment due to handrail

$$M_{lc} := N_{leg} \cdot F_{lc} \cdot \frac{(h_{lc} - h_{dis})^2}{2} = 167.42 \cdot \text{kip} \cdot \text{ft}$$

Moment due to leg columns

$$M_{rc} := F_{rc} \cdot \frac{(h_{rc} - h_{dis})^2}{2} = 22.53 \cdot \text{kip} \cdot \text{ft}$$

Moment due to riser column

$$M_{rod} := 2N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} \cdot \left(\frac{L1}{2}\right) = 17.56 \cdot \text{kip} \cdot \text{ft}$$

Moment due to rods

$$M_{app} := F_{TMO} \cdot (Z_{ant} - h_{dis}) + F_{OTHERS} \cdot (Z_{ant_others} - h_{dis}) = 240 \cdot \text{kip} \cdot \text{ft}$$

Moment due to equipment

$$M_2 := M_{bowl} + M_{hr} + M_{lc} + M_{rc} + M_{rod} = 1243.3 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 2 without equipment

$$M_{2t} := M_2 + M_{app} = 1483.31 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 2 with equipment

2. Shear Force

$$V_{bowl} := F_{bowl} = 22.43 \cdot \text{kip}$$

Wind load on water tank bowl

$$V_{hr} := F_{hr} = 2.03 \cdot \text{kip}$$

Wind load on handrail

$$V_{lc} := N_{leg} \cdot F_{lc} \cdot (h_{lc} - h_{dis}) = 9.6 \cdot \text{kip}$$

Wind load on leg columns

$$V_{rc} := F_{rc} \cdot (h_{rc} - h_{dis}) = 1.81 \cdot \text{kip}$$

Wind load on riser column

$$V_{rod} := 2 \cdot N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} = 1.01 \cdot \text{kip}$$

Wind load on rods

$$V_{app} := F_{TMO} + F_{OTHERS} = 7.01 \cdot \text{kip}$$

Wind load on equipment

$$V_2 := V_{bowl} + V_{hr} + V_{lc} + V_{rc} + V_{rod} = 36.88 \cdot \text{kip}$$

Wind load at Location 2 without equipment

$$V_{2t} := V_2 + V_{app} = 43.89 \cdot \text{kip}$$

Wind load at Location 2 with equipment

3. Axial Force

$$P_2 := W_w + W_{bowl} + \left(\frac{1}{3}\right)W_{col} = 2228.95 \cdot \text{kip}$$

Axial Load at Location 2 without equipment

$$P_{2t} := P_2 + W_{TOTAL} = 2234.53 \cdot \text{kip}$$

Axial Load at Location 2 with equipment

Forces At Location 3

1. Bending Moment

$$h_{dis} := L3$$

$$M_{bowl} := F_{bowl} \cdot (y_{bowl} - h_{dis}) = 1768.97 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to water tank bowl}$$

$$M_{hr} := F_{hr} \cdot (y_{hr} - h_{dis}) = 146.53 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to handrail}$$

$$M_{lc} := N_{leg} \cdot F_{lc} \cdot \frac{(h_{rc} - h_{dis})^2}{2} = 690.56 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to leg columns}$$

$$M_{rc} := F_{rc} \cdot \frac{(h_{rc} - h_{dis})^2}{2} = 134.73 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to riser column}$$

$$M_{rod} := 2N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} \cdot \left(\frac{L1}{2}\right) + 2 \cdot N_{leg} \cdot F_{r2} \cdot \sqrt{L2^2 + LD3^2} \cdot \left(\frac{L2}{2}\right) = 40 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to rods}$$

$$M_{strut} := \pi \cdot D_{p2} \cdot F_{s2} \cdot L2 = 96.93 \cdot \text{kip} \cdot \text{ft}$$

$$M_{app} := F_{TMO} \cdot (Z_{ant} - h_{dis}) + F_{OTHERS} \cdot (Z_{ant_others} - h_{dis}) = 492.29 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment due to equipment}$$

$$M_3 := M_{bowl} + M_{hr} + M_{lc} + M_{rc} + M_{rod} + M_{strut} = 2877.74 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment at Location 3 with equipment}$$

$$M_{3t} := M_3 + M_{app} = 3370.03 \cdot \text{kip} \cdot \text{ft} \quad \text{Moment at Location 3 without equipment}$$

2. Shear Force

$$V_{bowl} := F_{bowl} = 22.43 \cdot \text{kip} \quad \text{Wind load on water tank bowl}$$

$$V_{hr} := F_{hr} = 2.03 \cdot \text{kip} \quad \text{Wind load on handrail}$$

$$V_{lc} := N_{leg} \cdot F_{lc} \cdot (h_{lc} - h_{dis}) = 19.49 \cdot \text{kip} \quad \text{Wind load on leg columns}$$

$$V_{rc} := F_{rc} \cdot (h_{rc} - h_{dis}) = 4.43 \cdot \text{kip} \quad \text{Wind load on riser column}$$

$$V_{rod} := 2 \cdot N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} + 2 \cdot N_{leg} \cdot F_{r2} \cdot \sqrt{L2^2 + LD3^2} = 2.26 \cdot \text{kip} \quad \text{Wind load on rods}$$

$$V_{strut} := \pi \cdot D_{p2} \cdot F_{s2} = 2.69 \cdot \text{kip} \quad \text{Wind load on struts}$$

$$V_{app} := F_{TMO} + F_{OTHERS} = 7.01 \cdot \text{kip} \quad \text{Wind load on equipment}$$

$$V_3 := V_{bowl} + V_{hr} + V_{lc} + V_{rc} + V_{rod} + V_{strut} = 53.33 \cdot \text{kip} \quad \text{Wind load at Location 3 without equipment}$$

$$V_{3t} := V_3 + V_{app} = 60.34 \cdot \text{kip} \quad \text{Wind load at Location 3 with equipment}$$

3. Axial Force

$$P_3 := W_w + W_{bowl} + \left(\frac{2}{3}\right)W_{col} = 2261.45 \cdot \text{kip} \quad \text{Axial Load at Location 3 without equipment}$$

$$P_{3t} := P_3 + W_{TOTAL} = 2267.03 \cdot \text{kip} \quad \text{Axial Load at Location 3 with equipment}$$

Force At Locatin 4

1. Bending Moment $h_{dis} := 0ft$

$$M_{bowl} := F_{bowl} \cdot (y_{bowl} - h_{dis}) = 2579.66 \cdot \text{kip} \cdot \text{ft}$$

Moment due to water tank bowl

$$M_{hr} := F_{hr} \cdot (y_{hr} - h_{dis}) = 219.71 \cdot \text{kip} \cdot \text{ft}$$

Moment due to handrail

$$M_{lc} := N_{leg} \cdot F_{lc} \cdot \frac{(h_{lc} - h_{dis})^2}{2} = 1574.6 \cdot \text{kip} \cdot \text{ft}$$

Moment due to leg columns

$$M_{rc} := F_{rc} \cdot \frac{(h_{rc} - h_{dis})^2}{2} = 342.25 \cdot \text{kip} \cdot \text{ft}$$

Moment due to riser column

$$M_{rod} := 2N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} \cdot \left(\frac{L1}{2}\right) \dots = 64.84 \cdot \text{kip} \cdot \text{ft}$$

$$+ 2 \cdot N_{leg} \cdot F_{r2} \cdot \sqrt{L2^2 + LD3^2} \cdot \frac{L2}{2} \dots$$

$$+ 2 \cdot N_{leg} \cdot F_{r3} \cdot \sqrt{L3^2 + LD4^2} \cdot \frac{L3}{2}$$

Moment due to rods

$$M_{strut} := \pi \cdot D_{p2} \cdot F_{s2} \cdot L2 + \pi \cdot D_{p3} \cdot F_{s3} \cdot L3 = 201.12 \cdot \text{kip} \cdot \text{ft}$$

Moment due to struts

$$M_{app} := F_{TMO} \cdot (Z_{ant} - h_{dis}) + F_{OTHERS} \cdot (148.83ft - h_{dis}) = 918.12 \cdot \text{kip} \cdot \text{ft}$$

Moment due to equipment

$$M_4 := M_{bowl} + M_{hr} + M_{lc} + M_{rc} + M_{rod} + M_{strut} = 4982.18 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 3 with equipment

$$M_{4t} := M_4 + M_{app} = 5900.3 \cdot \text{kip} \cdot \text{ft}$$

Moment at Location 3 without equipment

2. Shear Force

$$V_{bowl} := F_{bowl} = 22.43 \cdot \text{kip}$$

Wind load on water tank bowl

$$V_{hr} := F_{hr} = 2.03 \cdot \text{kip}$$

Wind load on handrail

$$V_{lc} := N_{leg} \cdot F_{lc} \cdot (h_{lc} - h_{dis}) = 29.43 \cdot \text{kip}$$

Wind load on leg columns

$$V_{rc} := F_{rc} \cdot (h_{rc} - h_{dis}) = 7.06 \cdot \text{kip}$$

Wind load on riser column

$$V_{rod} := 2 \cdot N_{leg} \cdot F_{r1} \cdot \sqrt{L1^2 + LD2^2} \dots = 3.63 \cdot \text{kip}$$

$$+ 2 \cdot N_{leg} \cdot F_{r2} \cdot \sqrt{L2^2 + LD3^2} \dots$$

$$+ 2 \cdot N_{leg} \cdot F_{r3} \cdot \sqrt{L3^2 + LD4^2}$$

Wind load on rods

$$V_{strut} := \pi \cdot D_{p2} \cdot F_{s2} + \pi \cdot D_{p3} \cdot F_{s3} = 5.58 \cdot \text{kip}$$

$$V_{app} := F_{TMO} + F_{OTHERS} = 7.01 \cdot \text{kip}$$

Wind load on equipment

$$V_4 := V_{bowl} + V_{hr} + V_{lc} + V_{rc} + V_{rod} + V_{strut} = 70.16 \cdot \text{kip}$$

Wind load at Location 4 without equipment

$$V_{4t} := V_4 + V_{app} = 77.17 \cdot \text{kip}$$

Wind load at Location 4 with equipment

3. Axial Force

$$P_4 := W_w + W_m = 2293.96 \cdot \text{kip}$$

Axial Load at Location 4 without equipment

$$P_{4t} := P_4 + W_{TOTAL} = 2299.54 \cdot \text{kip}$$

Axial Load at Location 4 with equipment

Axial Load Distribution

$$A_{Xlc} := \pi \cdot d_{lc} \cdot t_{lc1} \cdot N_{leg} = 216.03 \cdot \text{in}^2$$

Total cross sectional area of legs

$$A_{Xrc} := \pi \cdot d_{rc} \cdot t_{rc} = 57.14 \cdot \text{in}^2$$

Cross sectional area of riser

$$A_{Xtotal} := A_{Xlc} + A_{Xrc} = 273.17 \cdot \text{in}^2$$

Combined cross sectional area of support members

$$\text{Leg}_{ratio_a} := \frac{A_{Xlc}}{A_{Xtotal}} = 79.08\%$$

Area based load support ratio for legs

$$\text{Riser}_{ratio_a} := \frac{A_{Xrc}}{A_{Xtotal}} = 20.92\%$$

Area based load support ratio for riser

$$\text{Leg}_{ratio_c} := \frac{N_{leg}}{N_{leg} + 1} = 85.71\%$$

Conservative based load support ratio for legs

$$\text{Leg}_{ratio} := \max(\text{Leg}_{ratio_a}, \text{Leg}_{ratio_c}) = 85.71\%$$

Use conservative ratio

Panel 1 Data

$d_{r1} = 1.375 \cdot \text{in}$	Bracing rod diameter
$d_{lc} = 30.56 \cdot \text{in}$	Outside diameter of leg col.
$d_{lc_in} = 30.188 \cdot \text{in}$	Inside diameter of leg col.
$t_{lc1} = 0.375 \cdot \text{in}$	Thickness of leg col.
$A_{s1} := 0 \text{in}^2$	No Strut on Top of panel 1
$\alpha := \alpha_{leg}$	

Panel 1 Analysis

$$F_1 := \max \left[\frac{M_1}{d_{\text{tank}} \cdot (0.5 + \sin(\alpha))}, \frac{M_1}{d_{\text{tank}} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 3.34 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{1t} := \max \left[\frac{M_{1t}}{d_{\text{tank}} \cdot (0.5 + \sin(\alpha))}, \frac{M_{1t}}{d_{\text{tank}} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 3.58 \cdot \text{kip} \quad \text{Total Force with antennas}$$

$$F_2 := \max \left[\frac{M_2}{D_{p2} \cdot (0.5 + \sin(\alpha))}, \frac{M_2}{D_{p2} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 21.22 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{2t} := \max \left[\frac{M_{2t}}{D_{p2} \cdot (0.5 + \sin(\alpha))}, \frac{M_{2t}}{D_{p2} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 25.32 \cdot \text{kip} \quad \text{Total Force with antennas}$$

1. Column total stress at Panel 1

$$f_w := \frac{F_2}{(\pi d_{lc} \cdot t_{lc1})} = 0.59 \cdot \text{ksi} \quad \text{Column stress from wind}$$

$$f_a := \frac{\left(\frac{P_2 \cdot \text{Legratio}}{N_{leg}} \right)}{(\pi d_{lc} \cdot t_{lc1})} = 8.84 \cdot \text{ksi} \quad \text{Column stress from axial load}$$

$$f_{wt} := \frac{F_{2t}}{(\pi d_{lc} \cdot t_{lc1})} = 0.7 \cdot \text{ksi} \quad \text{Column stress from wind with antennas}$$

$$f_{at} := \frac{\left(\frac{P_{2t} \cdot \text{Legratio}}{N_{leg}} \right)}{(\pi d_{lc} \cdot t_{lc1})} = 8.87 \cdot \text{ksi} \quad \text{Column stress from axial load with antennas}$$

$$f_1 := f_w + f_a = 9.43 \cdot \text{ksi}$$

Total column stress without antennas

$$f_{1t} := f_{wt} + f_{at} = 9.57 \cdot \text{ksi}$$

Total column stress with antennas

$$\Delta C1 := \frac{f_{1t} - f_1}{f_1} = 1.44 \cdot \%$$

Stress increase on column

2. Bracing rod Stress at Panel 1

$$F_{b1} := \frac{F_2 - F_1}{2 \sin(\theta_1)} = 10.41 \cdot \text{kip}$$

Force on bracing rod without antennas

$$F_{b1t} := \frac{F_{2t} - F_{1t}}{2 \sin(\theta_1)} = 12.65 \cdot \text{kip}$$

Force on bracing rod with antennas

$$\sigma_{b1} := \frac{(F_{b1})}{(0.25\pi d_{r1}^2)} = 7.01 \cdot \text{ksi}$$

Stress on bracing rod without antennas

$$\sigma_{b1t} := \frac{(F_{b1t})}{(0.25\pi d_{r1}^2)} = 8.52 \cdot \text{ksi}$$

Stress on bracing rod with antennas

$$\Delta R1 := \frac{\sigma_{b1t} - \sigma_{b1}}{\sigma_{b1}} = 21.55 \cdot \%$$

Stress increase on bracing rod

$$\sigma_{rod_allow} := 15 \text{ksi} \cdot 1.33 = 19.95 \cdot \text{ksi}$$

Allowable rod stress (per AWWA table 4 & sec. 3.3.3)

$$\text{if}(\sigma_{b1t} < \sigma_{rod_allow}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$$

Rod stress is OK

Allowable Compressive Strength for Column

$L := L1 = 34.75 \text{ ft}$

$K := 1$

$t := t_{lc1} = 0.375 \cdot \text{in}$

$R := 0.5d_{lc} = 15.28 \cdot \text{in}$

$E := 29000 \text{ ksi}$

$r := \frac{(d_{lc}^2 + d_{lc_in}^2)^{0.5}}{4} = 10.74 \cdot \text{in}$

Radius of Gyration

$SR := \frac{K \cdot L}{r} = 38.83$

Slenderness Ratio

$tRc := 0.00035372$

Thickness to radius ratio change from elastic to inelastic (per AWWA)

$FL := \begin{cases} 17.5(10^5) \cdot \frac{t}{R} \left[1 + 50000 \cdot \left(\frac{t}{R} \right)^2 \right] \text{ psi} & \text{if } 0 \leq \frac{t}{R} \leq tRc \\ \left[6925 + 886(10)^3 \cdot \frac{t}{R} \right] \text{ psi} & \text{if } tRc \leq \frac{t}{R} \leq 0.0125 \\ (18000 \text{ psi}) & \text{otherwise} \end{cases}$

Allowable local compressive stress (per AWWA sec. 3.4.3.1.1) for a Class 2 material (Eq 3-11 & Eq 3-13)

$FL = 18 \cdot \text{ksi}$

$C_c := \sqrt{\frac{\pi^2 \cdot E}{FL}} = 126.1$

Column Slenderness ratio at beginning of elastic column buckling (per AWWA sec. 3.4.1.6) (Eq 3-10)

$K\phi := \begin{cases} 1 - \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } 25 < SR \leq C_c \\ \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } SR \geq C_c \\ (1) & \text{otherwise} \end{cases}$

Slenderness reduction facto $K\phi$ (per AWWA sec. 3.4.1.6) (Eq 3-7, Eq 3-8 & Eq 3-9)

$K\phi = 0.95$

$FL_{\text{allowable1}} := 1.33FL \cdot K\phi = 22.81 \cdot \text{ksi}$

Allowable local compressive buckling stress of leg column. With 33% increase (per AWWA sec. 3.3.3)

$\text{if} \left(\frac{f_{1t}}{FL_{\text{allowable1}}} \leq 1, \text{"PASS"}, \text{"FAIL"} \right) = \text{"PASS"}$

Column Stress is OK

Panel 2 Data

$d_{r2} = 1.625 \cdot \text{in}$	Bracing rod diameter
$d_{lc} = 30.56 \cdot \text{in}$	Outside diameter of leg col.
$d_{lc_in} = 30.188 \cdot \text{in}$	Inside diameter of leg col.
$t_{lc2} = 0.375 \cdot \text{in}$	Thickness of leg col.
$A_{strut2} := 5.27 \text{in}^2$	Strut 2 (C7x9.8+C6x8.2) at top of panel 2

Panel 2 Analysis

$$F_2 := \max \left[\frac{M_2}{D_{p2} \cdot (0.5 + \sin(\alpha))}, \frac{M_2}{D_{p2} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 21.22 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{2t} := \max \left[\frac{M_{2t}}{D_{p2} \cdot (0.5 + \sin(\alpha))}, \frac{M_{2t}}{D_{p2} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 25.32 \cdot \text{kip} \quad \text{Total Force with antennas}$$

$$F_3 := \max \left[\frac{M_3}{D_{p3} \cdot (0.5 + \sin(\alpha))}, \frac{M_3}{D_{p3} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 45.91 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{3t} := \max \left[\frac{M_{3t}}{D_{p3} \cdot (0.5 + \sin(\alpha))}, \frac{M_{3t}}{D_{p3} \cdot \left(\sin \left(\alpha + \frac{\alpha}{2} \right) + \sin(\alpha) \right)} \right] = 53.77 \cdot \text{kip} \quad \text{Total Force with antennas}$$

1. Column total stress at Panel 2

$$f_w := \frac{F_3}{(\pi d_{lc} \cdot t_{lc2})} = 1.28 \cdot \text{ksi} \quad \text{Column stress from wind}$$

$$f_a := \frac{\left(\frac{P_3 \cdot \text{Legratio}}{N_{leg}} \right)}{(\pi d_{lc} \cdot t_{lc2})} = 8.97 \cdot \text{ksi} \quad \text{Column stress from axial load}$$

$$f_{wt} := \frac{F_{3t}}{(\pi d_{lc} \cdot t_{lc2})} = 1.49 \cdot \text{ksi} \quad \text{Column stress from wind with antennas}$$

$$f_{at} := \frac{\left(\frac{P_{3t} \cdot \text{Legratio}}{N_{leg}} \right)}{(\pi d_{lc} \cdot t_{lc2})} = 8.99 \cdot \text{ksi} \quad \text{Column stress from axial load with antennas}$$

$$f_2 := f_w + f_a = 10.25 \cdot \text{ksi}$$

Total column stress without antennas

$$f_{2t} := f_{wt} + f_{at} = 10.49 \cdot \text{ksi}$$

Total column stress with antennas

$$\Delta C2 := \frac{f_{2t} - f_2}{f_{2t}} = 2.29 \cdot \%$$

Stress increase on column

2. Bracing rod Stress at Panel 2

$$F_{b2} := \frac{F_3 - F_2}{2 \sin(\theta_2)} = 14.51 \cdot \text{kip}$$

Force on bracing rod without antennas

$$F_{b2t} := \frac{F_{3t} - F_{2t}}{2 \sin(\theta_2)} = 16.72 \cdot \text{kip}$$

Force on bracing rod with antennas

$$\sigma_{b2} := \frac{(F_{b2})}{(0.25\pi d_{r2}^2)} = 7 \cdot \text{ksi}$$

Stress on bracing rod without antennas

$$\sigma_{b2t} := \frac{(F_{b2t})}{(0.25\pi d_{r2}^2)} = 8.06 \cdot \text{ksi}$$

Stress on bracing rod with antennas

$$\Delta R2 := \frac{\sigma_{b2t} - \sigma_{b2}}{\sigma_{b2}} = 15.22 \cdot \%$$

Stress increase on bracing rod

$$\text{if}(\sigma_{b2t} < \sigma_{\text{rod_allow}}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$$

Rod stress is OK

3. Strut Stress at Panel 2

$$F_{s2} := F_{b2} \cdot \cos(\theta_1) = 7.43 \cdot \text{kip}$$

Force on bracing rod without antennas

$$F_{s2t} := F_{b2t} \cdot \cos(\theta_1) = 8.56 \cdot \text{kip}$$

Force on bracing rod with antennas

$$\sigma_{s2} := \frac{(F_{s2})}{(0.25\pi d_{r2}^2)} = 3.58 \cdot \text{ksi}$$

Stress on bracing rod without antennas

$$\sigma_{s2t} := \frac{(F_{s2t})}{(0.25\pi d_{r2}^2)} = 4.13 \cdot \text{ksi}$$

Stress on bracing rod with antennas

$$\Delta S2 := \frac{\sigma_{s2t} - \sigma_{s2}}{\sigma_{s2}} = 15.22 \cdot \%$$

Stress increase on bracing rod

Allowable Compressive Strength for Column

$L := L2 = 35.97 \text{ ft}$

$K := 1$

$t := t_{lc2} = 0.375 \cdot \text{in}$

$R := 0.5d_{lc} = 15.28 \cdot \text{in}$

$E := 29000 \text{ ksi}$

$r := \frac{(d_{lc}^2 + d_{lc_in}^2)^{0.5}}{4} = 10.74 \cdot \text{in}$

Radius of Gyration

$SR := \frac{K \cdot L}{r} = 40.19$

Slenderness Ratio

$tRc := 0.00035372$

Thickness to radius ratio change from elastic to inelastic (per AWWA)

$FL := \begin{cases} 17.5(10^5) \cdot \frac{t}{R} \left[1 + 50000 \cdot \left(\frac{t}{R} \right)^2 \right] \text{ psi} & \text{if } 0 \leq \frac{t}{R} \leq tRc \\ \left[6925 + 886(10)^3 \cdot \frac{t}{R} \right] \text{ psi} & \text{if } tRc \leq \frac{t}{R} \leq 0.0125 \\ (18000 \text{ psi}) & \text{otherwise} \end{cases}$

Allowable local compressive stress (per AWWA sec. 3.4.3.1.1) for a Class 2 material (Eq 3-11 & Eq 3-13)

$FL = 18 \cdot \text{ksi}$

$C_c := \sqrt{\frac{\pi^2 \cdot E}{FL}} = 126.1$

Column Slenderness ratio at beginning of elastic column buckling (per AWWA sec. 3.4.1.6) (Eq 3-10)

$K\phi := \begin{cases} 1 - \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } 25 < SR \leq C_c \\ \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } SR \geq C_c \\ (1) & \text{otherwise} \end{cases}$

Slenderness reduction facto $K\phi$ (per AWWA sec. 3.4.1.6) (Eq 3-7, Eq 3-8 & Eq 3-9)

$K\phi = 0.95$

$FL_{\text{allowable2}} := 1.33FL \cdot K\phi = 22.72 \cdot \text{ksi}$

Allowable local compressive buckling stress of leg column. With 33% increase (per AWWA sec. 3.3.3)

$\text{if} \left(\frac{f_{2t}}{FL_{\text{allowable2}}} \leq 1, \text{"PASS"}, \text{"FAIL"} \right) = \text{"PASS"}$

Column Stress is OK

Allowable Compressive Strength for Strut (C8x24)

$K = 1$

$F_y := 36\text{ksi}$

$L := LD_2 = 21.45\text{ft}$

$r := 3.42\text{in}$

$SR := \frac{K \cdot L}{r} = 75.25$

$F_e := \frac{\pi^2 E}{SR^2} = 50.55\text{ksi}$

Radius of gyration for strut (per AISC 14th ed.)

Slenderness ratio of strut

Elastic buckling stress (per AISC 14th ed.) (Eq: E3-4)

$$F_{\text{allowable_s2}} := \begin{cases} \left(0.658 \frac{F_y}{F_e}\right) \cdot F_y & \text{if } SR \leq 4.71 \sqrt{\frac{E}{F_y}} \\ (0.877 \cdot F_e) & \text{otherwise} \end{cases}$$

Allowable compressive stress of strut (per AISC 14th ed.) (Eq: E3-2 & E3-3)

$F_{\text{allowable_s2}} = 26.72\text{ksi}$

Allowable compressive stress for strut

if $\left(\frac{\sigma_{s2t}}{F_{\text{allowable_s2}}} \leq 1, \text{"PASS"}, \text{"FAIL"} \right) = \text{"PASS"}$

Strut Stress is OK

Panel 3 Data

$d_{r3} = 1.75$ -in Bracing rod diameter
 $d_{lc} = 30.56$ -in Outside diameter of leg col.
 $d_{lc_in} = 30.188$ -in Inside diameter of leg col.
 $t_{lc3} = 0.375$ -in Thickness of leg col.
 $A_{strut2} := 7.05$ in² Strut 3 (C8x24) at top of panel 3

Panel 3 Analysis

$$F_3 := \max \left[\frac{M_3}{D_{p3} \cdot (0.5 + \sin(\alpha))}, \frac{M_3}{D_{p3} \cdot \left(\sin\left(\alpha + \frac{\alpha}{2}\right) + \sin(\alpha) \right)} \right] = 45.91 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{3t} := \max \left[\frac{M_{3t}}{D_{p3} \cdot (0.5 + \sin(\alpha))}, \frac{M_{3t}}{D_{p3} \cdot \left(\sin\left(\alpha + \frac{\alpha}{2}\right) + \sin(\alpha) \right)} \right] = 53.77 \cdot \text{kip} \quad \text{Total Force with antennas}$$

$$F_4 := \max \left[\frac{M_4}{D_{p4} \cdot (0.5 + \sin(\alpha))}, \frac{M_4}{D_{p4} \cdot \left(\sin\left(\alpha + \frac{\alpha}{2}\right) + \sin(\alpha) \right)} \right] = 74.59 \cdot \text{kip} \quad \text{Total Force without Antennas}$$

$$F_{4t} := \max \left[\frac{M_{4t}}{D_{p4} \cdot (0.5 + \sin(\alpha))}, \frac{M_{4t}}{D_{p4} \cdot \left(\sin\left(\alpha + \frac{\alpha}{2}\right) + \sin(\alpha) \right)} \right] = 88.33 \cdot \text{kip} \quad \text{Total Force with antennas}$$

1. Column total stress at Panel 3

$$f_w := \frac{F_4}{(\pi d_{lc} \cdot t_{lc3})} = 2.07 \cdot \text{ksi} \quad \text{Column stress from wind}$$

$$f_a := \frac{\left(\frac{P_4 \cdot \text{Legratio}}{N_{leg}} \right)}{\pi d_{lc} \cdot t_{lc3}} = 9.1 \cdot \text{ksi} \quad \text{Column stress from axial load}$$

$$f_{wt} := \frac{F_{4t}}{(\pi d_{lc} \cdot t_{lc3})} = 2.45 \cdot \text{ksi} \quad \text{Column stress from wind with antennas}$$

$$f_{at} := \frac{\left(\frac{P_{4t} \cdot \text{Legratio}}{N_{leg}} \right)}{(\pi d_{lc} \cdot t_{lc3})} = 9.12 \cdot \text{ksi} \quad \text{Column stress from axial load with antennas}$$

$$f_3 := f_w + f_a = 11.17 \cdot \text{ksi}$$

Total column stress without antennas

$$f_{3t} := f_{wt} + f_{at} = 11.58 \cdot \text{ksi}$$

Total column stress with antennas

$$\Delta C3 := \frac{f_{3t} - f_3}{f_3} = 3.61 \cdot \%$$

Stress increase on column

2. Bracing rod Stress at Panel 3

$$F_{b3} := \frac{F_4 - F_3}{2 \sin(\theta_3)} = 17.14 \cdot \text{kip}$$

Force on bracing rod without antennas

$$F_{b3t} := \frac{F_{4t} - F_{3t}}{2 \sin(\theta_3)} = 20.66 \cdot \text{kip}$$

Force on bracing rod with antennas

$$\sigma_{b3} := \frac{(F_{b3})}{(0.25\pi d_{r3}^2)} = 7.13 \cdot \text{ksi}$$

Stress on bracing rod without antennas

$$\sigma_{b3t} := \frac{(F_{b3t})}{(0.25\pi d_{r3}^2)} = 8.59 \cdot \text{ksi}$$

Stress on bracing rod with antennas

$$\Delta R3 := \frac{\sigma_{b3t} - \sigma_{b3}}{\sigma_{b3}} = 20.54 \cdot \%$$

Stress increase on bracing rod

$$\text{if}(\sigma_{b3t} < \sigma_{\text{rod_allow}}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$$

Rod stress is OK

3. Strut Stress at Panel 3

$$F_{s3} := F_{b3} \cdot \cos(\theta_3) = 9.4 \cdot \text{kip}$$

Force on strut without antennas

$$F_{s3t} := F_{b3t} \cdot \cos(\theta_3) = 11.33 \cdot \text{kip}$$

Force on strut with antennas

$$\sigma_{s3} := \frac{(F_{s3})}{(0.25\pi d_{r3}^2)} = 3.91 \cdot \text{ksi}$$

Stress on strut without antennas

$$\sigma_{s3t} := \frac{(F_{s3t})}{(0.25\pi d_{r3}^2)} = 4.71 \cdot \text{ksi}$$

Stress on strut with antennas

$$\Delta S3 := \frac{\sigma_{s3t} - \sigma_{s3}}{\sigma_{s3}} = 20.54 \cdot \%$$

Stress increase on strut

Allowable Compressive Strength for Column

$L := L3 = 36.14 \text{ ft}$

$K := 1$

$t := t_{lc3} = 0.375 \cdot \text{in}$

$R := 0.5d_{lc} = 15.28 \cdot \text{in}$

$E := 29000 \text{ ksi}$

$r := \frac{(d_{lc}^2 + d_{lc_in}^2)^{0.5}}{4} = 10.74 \cdot \text{in}$

Radius of Gyration

$SR := \frac{K \cdot L}{r} = 40.38$

Slenderness Ratio

$tRc := 0.00035372$

Thickness to radius ratio change from elastic to inelastic (per AWWA)

$FL := \begin{cases} 17.5(10^5) \cdot \frac{t}{R} \left[1 + 50000 \cdot \left(\frac{t}{R} \right)^2 \right] \text{ psi} & \text{if } 0 \leq \frac{t}{R} \leq tRc \\ \left[6925 + 886(10)^3 \cdot \frac{t}{R} \right] \text{ psi} & \text{if } tRc \leq \frac{t}{R} \leq 0.0125 \\ (18000 \text{ psi}) & \text{otherwise} \end{cases}$

Allowable local compressive stress (per AWWA sec. 3.4.3.1.1) for a Class 2 material (Eq 3-11 & Eq 3-13)

$FL = 18 \cdot \text{ksi}$

$C_c := \sqrt{\frac{\pi^2 \cdot E}{FL}} = 126.1$

Column Slenderness ratio at beginning of elastic column buckling (per AWWA sec. 3.4.1.6) (Eq 3-10)

$K\phi := \begin{cases} 1 - \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } 25 < SR \leq C_c \\ \frac{1}{2} \left(\frac{SR}{C_c} \right)^2 & \text{if } SR \geq C_c \\ (1) & \text{otherwise} \end{cases}$

Slenderness reduction factor $K\phi$ (per AWWA sec. 3.4.1.6) (Eq 3-7, Eq 3-8 & Eq 3-9)

$K\phi = 0.95$

$FL_{allowable3} := 1.33FL \cdot K\phi = 22.71 \cdot \text{ksi}$

Allowable local compressive buckling stress of leg column. With 33% increase (per AWWA sec. 3.3.3)

$\text{if} \left(\frac{f_{3t}}{FL_{allowable3}} \leq 1, \text{"PASS"}, \text{"FAIL"} \right) = \text{"PASS"}$

Column Stress is OK

Allowable Compressive Strength for Strut (W8x24)

$K = 1$ $F_y := 36\text{ksi}$

$L := LD_3 = 22.94\text{ft}$

$r := 3.42\text{in}$

$SR := \frac{K \cdot L}{r} = 80.5$

$F_e := \frac{\pi^2 E}{SR^2} = 44.17 \cdot \text{ksi}$

$$F_{\text{allowable_s3}} := \begin{cases} \left(0.658 \frac{F_y}{F_e}\right) \cdot F_y & \text{if } SR \leq 4.71 \sqrt{\frac{E}{F_y}} \\ (0.877 \cdot F_e) & \text{otherwise} \end{cases}$$

$F_{\text{allowable_s3}} = 25.6 \cdot \text{ksi}$

if $\left(\frac{\sigma_{s3t}}{F_{\text{allowable_s3}}} \leq 1, \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

Radius of gyration for strut (per AISC 14th ed.)

Slenderness ratio of strut

Elastic buckling stress (per AISC 14th ed.) (Eq: E3-4)

Allowable compressive stress of strut (per AISC 14th ed.) (Eq: E3-2 & E3-3)

Allowable compressive stress for strut

Strut Stress is OK

Uplift & Anchor Bolt Check

$$d_{\text{bolt}} = 1.75 \cdot \text{in}$$

$$d_{\text{fnd}} = 48.9 \text{ ft}$$

$$n_{\text{bolt}} = 2$$

$$d_{\text{bolt_root}} = 1.53 \cdot \text{in}$$

Per AISC 14th ed. table 7-17

$$A_{\text{bolt_root}} = 1.85 \cdot \text{in}^2$$

Per AISC 14th ed. table 7-17

$$V_{\text{base}} := V_{4t} = 77.17 \cdot \text{kip}$$

$$M_{\text{base}} := M_{4t} = 5900.3 \cdot \text{kip} \cdot \text{ft}$$

$$P_W := \frac{4 \cdot M_{\text{base}}}{N_{\text{leg}} \cdot n_{\text{bolt}} \cdot d_{\text{fnd}}} - \frac{W_{\text{empty}} + W_{\text{EQ}}}{N_{\text{leg}} \cdot n_{\text{bolt}}} = 22.38 \cdot \text{kip}$$

Uplift force per anchor from wind
(per AWWA sec.3.8.9.1)(Eq 3-41)

$$T_{\text{actual}} := \frac{P_W}{A_{\text{bolt_root}}} + \frac{V_{\text{base}}}{N_{\text{leg}} \cdot n_{\text{bolt}} \cdot A_{\text{bolt_root}}} = 15.57 \cdot \text{ksi}$$

Stress in anchor bolt due to uplift
force

$$T_{\text{allow}} := 15 \text{ ksi} \cdot 1.33 = 19.95 \cdot \text{ksi}$$

Allowable tension (per AWWA table
4) & allowable increase for wind
resistance (per AWWA sec. 3.3.3)

$$\text{if} \left(\frac{T_{\text{actual}}}{T_{\text{allow}}} \leq 1, \text{"PASS"}, \text{"FAIL"} \right) = \text{"PASS"}$$

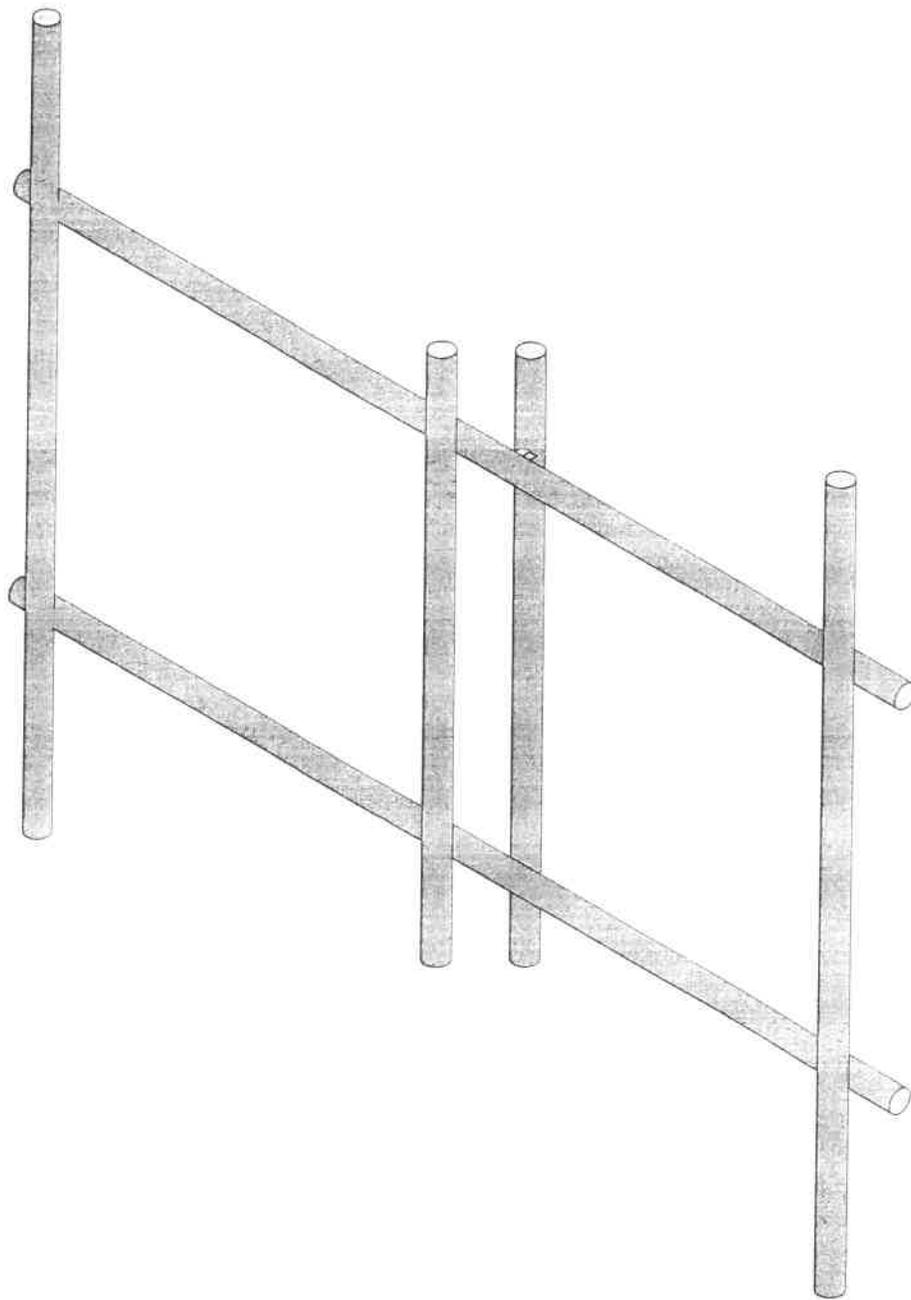
Anchor bolt check OK, anchor bolts
capable of resisting applied forces
per ANSI/TIA & AWWA guidelines

$$\text{AB_Capacity} := \frac{T_{\text{actual}}}{T_{\text{allow}}} = 78.05 \cdot \%$$

Anchor bolt capacity

Water Tank Structural Analysis Summary

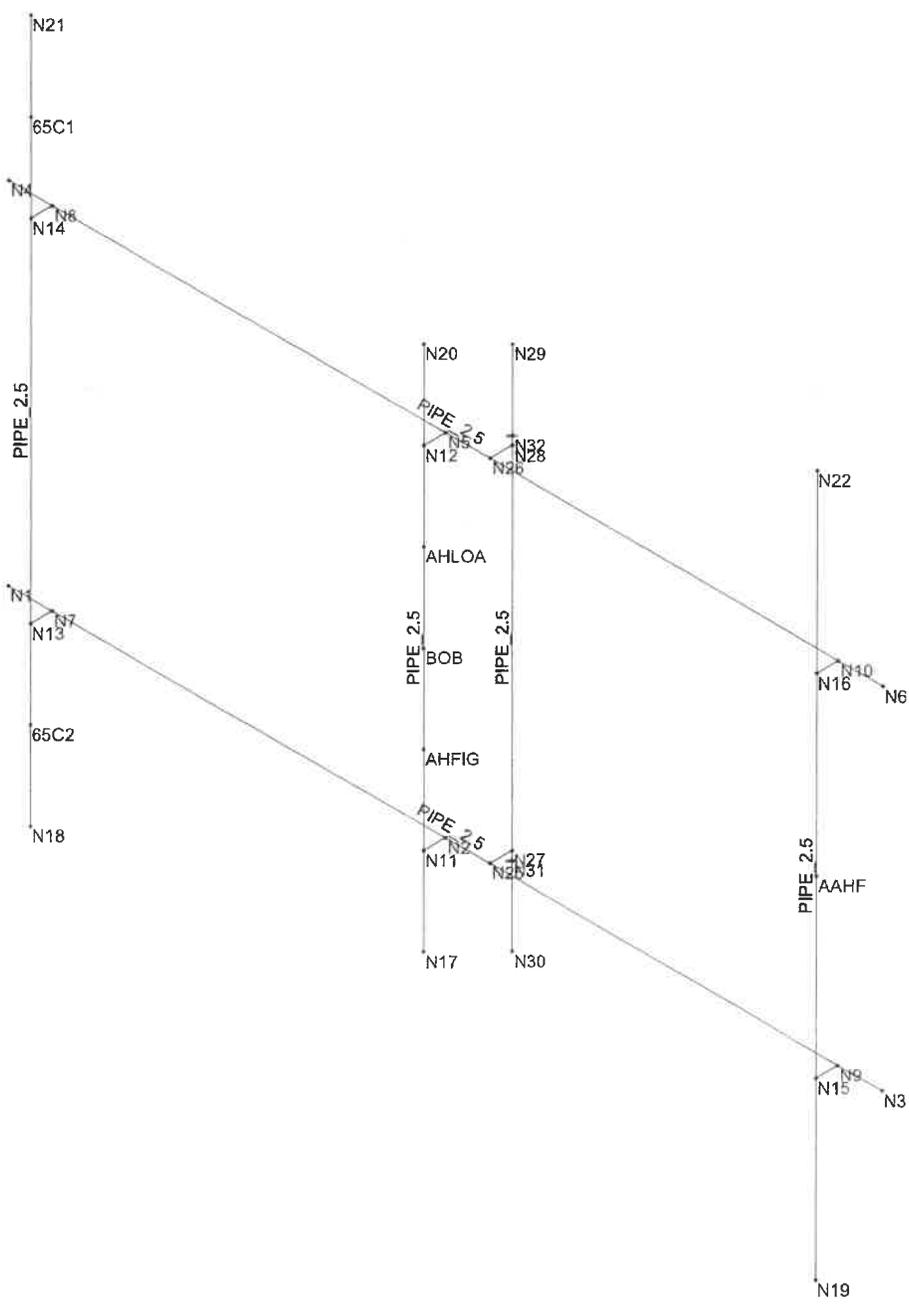
Panel 1	Without Antenna	With Antennas	%Increase	Allowable Stress
Column Stress	$f_1 = 9.43 \cdot \text{ksi}$	$f_{1t} = 9.57 \cdot \text{ksi}$	$\Delta C1 = 1.44 \cdot \%$	Less than 21.41 ksi, OK
Rod Stress	$\sigma_{b1} = 7.01 \cdot \text{ksi}$	$\sigma_{b1t} = 8.52 \cdot \text{ksi}$	$\Delta R1 = 21.55 \cdot \%$	Less than 19.95 ksi, OK
Strut Stress	No Strut	No Strut	No Strut	See Panel 2 for strut
Panel 2	Without Antenna	With Antennas	%Increase	Allowable Stress
Column Stress	$f_2 = 10.25 \cdot \text{ksi}$	$f_{2t} = 10.49 \cdot \text{ksi}$	$\Delta C2 = 2.29 \cdot \%$	Less than 21.45 ksi, OK
Rod Stress	$\sigma_{b2} = 7 \cdot \text{ksi}$	$\sigma_{b2t} = 8.06 \cdot \text{ksi}$	$\Delta R2 = 15.22 \cdot \%$	Less than 19.95 ksi, OK
Strut Stress	$\sigma_{s2} = 3.58 \cdot \text{ksi}$	$\sigma_{s2t} = 4.13 \cdot \text{ksi}$	$\Delta S2 = 15.22 \cdot \%$	Less than 21.21 ksi, OK
Panel 3	Without Antenna	With Antennas	%Increase	Allowable Stress
Column Stress	$f_3 = 11.17 \cdot \text{ksi}$	$f_{3t} = 11.58 \cdot \text{ksi}$	$\Delta C3 = 3.61 \cdot \%$	Less than 21.23 ksi, OK
Rod Stress	$\sigma_{b3} = 7.13 \cdot \text{ksi}$	$\sigma_{b3t} = 8.59 \cdot \text{ksi}$	$\Delta R3 = 20.54 \cdot \%$	Less than 19.95 ksi, OK
Strut Stress	$\sigma_{s3} = 3.91 \cdot \text{ksi}$	$\sigma_{s3t} = 4.71 \cdot \text{ksi}$	$\Delta S3 = 20.54 \cdot \%$	Less than 19.92 ksi, OK



KCS
FC
CH42545B

Antenna Mount Frame
3D Render

SK - 1
June 23, 2020 at 10:12 AM
Antenna Mounting Frame.r3d



KCS

FC

CH42545B

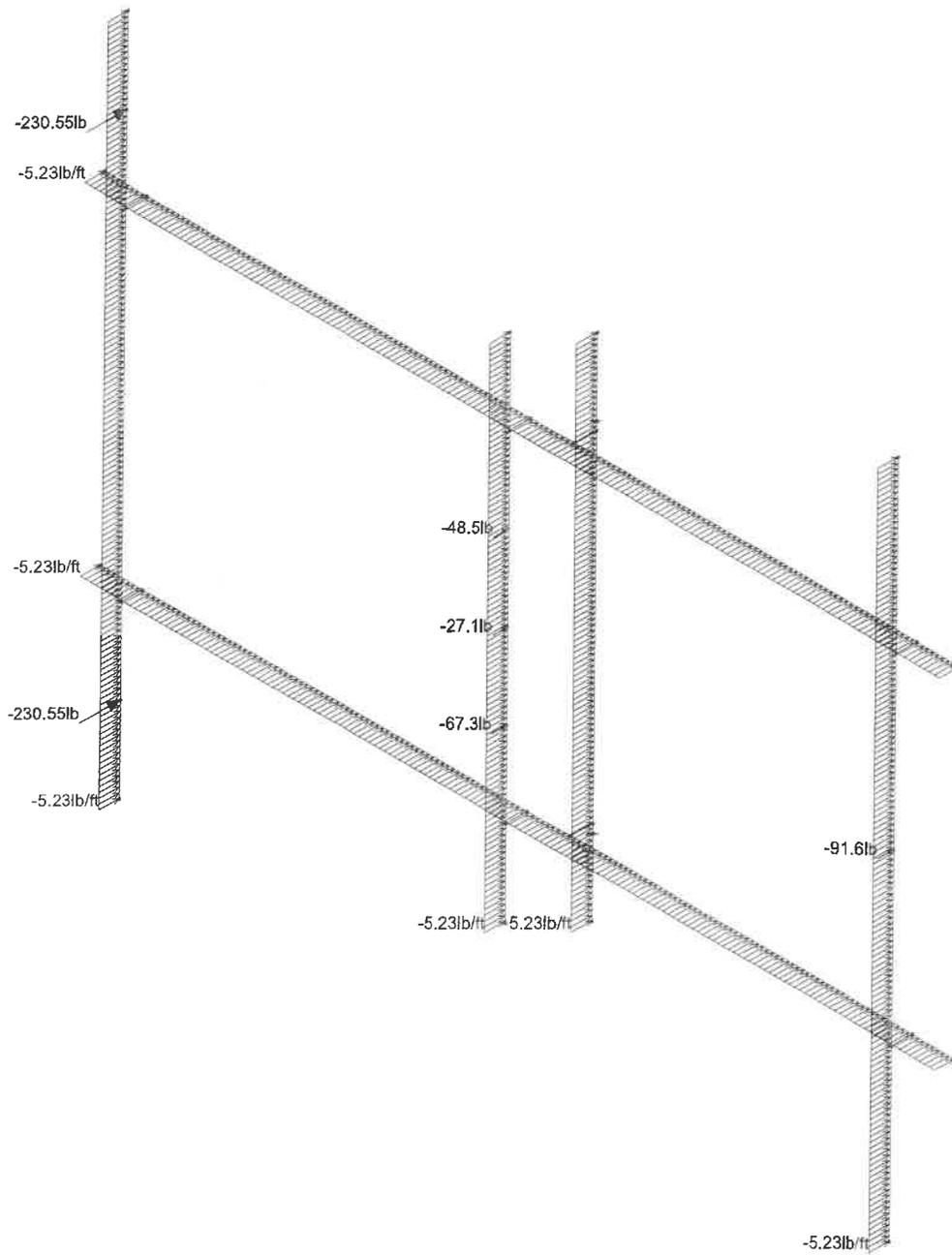
Antenna Mount Frame

Shapes and Nodes

SK - 2

June 23, 2020 at 10:12 AM

Antenna Mounting Frame.r3d

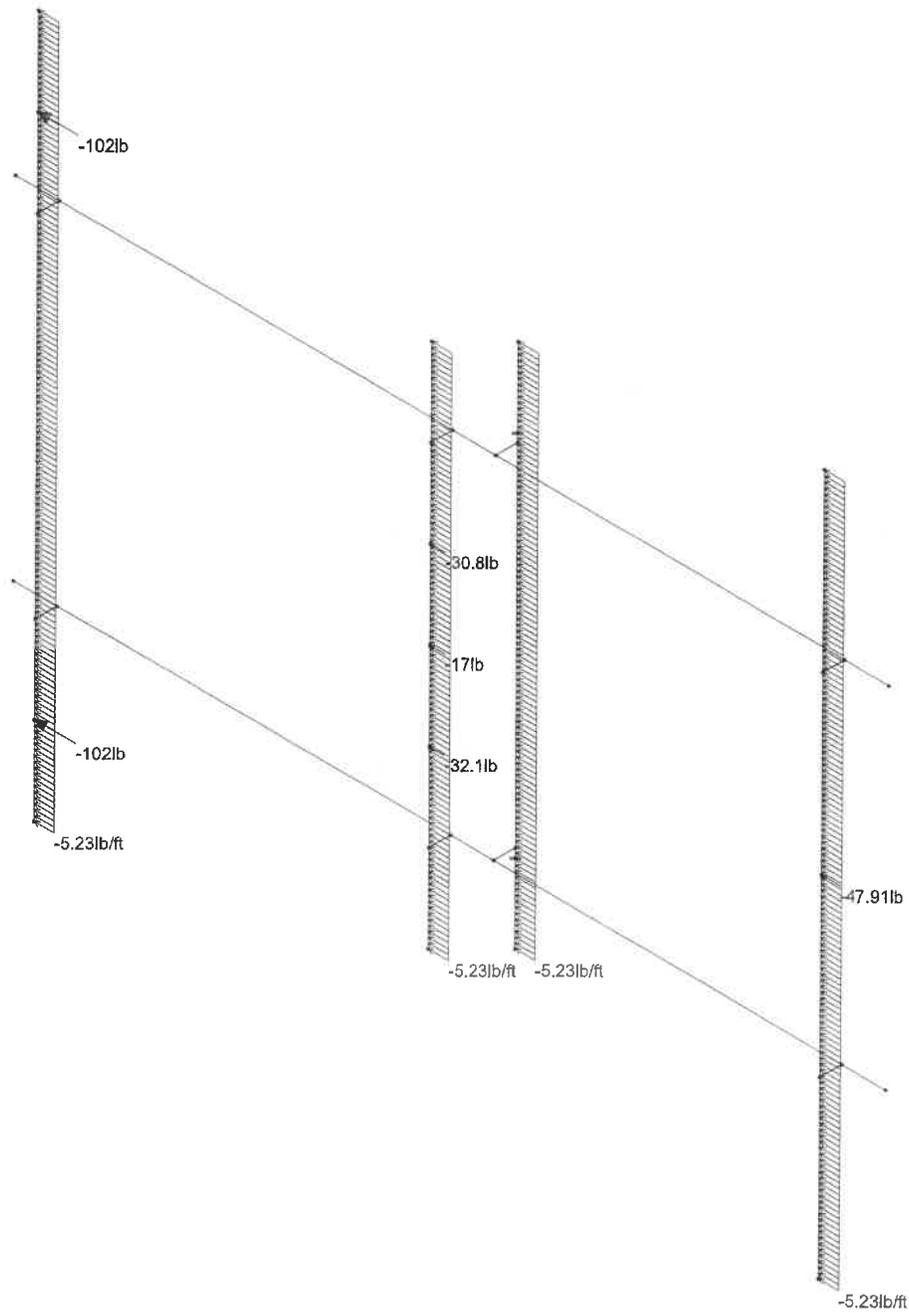


Loads: BLC 2, Wind Z

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Antenna Mount Frame
Wind Load (Z-Direction)

SK - 3
June 23, 2020 at 10:13 AM
Antenna Mounting Frame.r3d

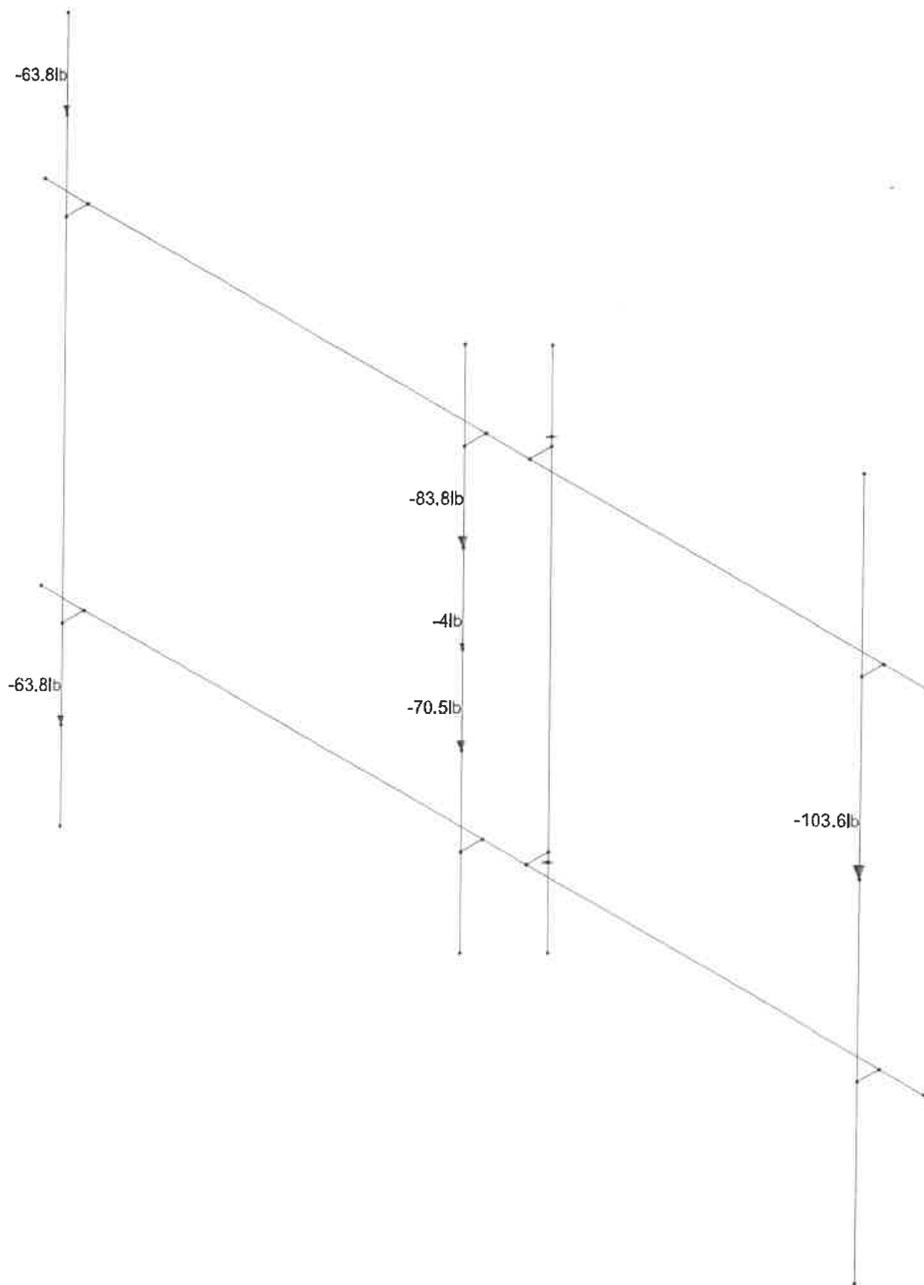


Loads: BLC 3, Wind X

KCS
FC
CH42545B

Antenna Mount Frame
Wind Load (X-Direction)

SK - 4
June 23, 2020 at 10:13 AM
Antenna Mounting Frame.r3d



Loads: BLC 1, Dead Load

KCS
FC
CH42545B

Antenna Mount Frame
Dead Loads

SK - 5
June 23, 2020 at 10:14 AM
Antenna Mounting Frame.r3d

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N4	N6		270	Pipe 2.5	Column	Pipe	A53 Gr.B	Typical
2	M2	N1	N3		180	Pipe 2.5	Column	Pipe	A53 Gr.B	Typical
3	M3	N8	N14			RIGID	None	None	RIGID	DR1
4	M4	N7	N13			RIGID	None	None	RIGID	DR1
5	M5	N2	N11			RIGID	None	None	RIGID	DR1
6	M6	N9	N15			RIGID	None	None	RIGID	DR1
7	M7	N5	N12			RIGID	None	None	RIGID	DR1
8	M8	N10	N16			RIGID	None	None	RIGID	DR1
9	M9	N18	N21			Pipe 2.5	Column	Pipe	A53 Gr.B	Typical
10	M10	N17	N20			Pipe 2.5	Column	Pipe	A53 Gr.B	Typical
11	M11	N19	N22			Pipe 2.5	Column	Pipe	A53 Gr.B	Typical
12	M12	N26	N28			RIGID	None	None	RIGID	DR1
13	M13	N25	N27			RIGID	None	None	RIGID	DR1
14	M14	N30	N29			Pipe 2.5	Column	Pipe	A53 Gr.B	Typical

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N32	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N31	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Pipe 2.5	10			Lbyy						Lateral
2	M2	Pipe 2.5	10			Lbyy						Lateral
3	M9	Pipe 2.5	8									Lateral
4	M10	Pipe 2.5	6									Lateral
5	M11	Pipe 2.5	8									Lateral
6	M14	Pipe 2.5	5.991									Lateral

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distri...	Area(Memb...	Surface(Plate/Wall)
1	Dead Load	DL		-1		6				
2	Wind Z	WLZ				6		6		
3	Wind X	WLX				6		4		

Load Combinations

	Description	Sol...	PDelta	SR...	B...	Factor	BLC	Factor	BLC	Fac...	BLC	F...	B...	F...
1	1.2DL+1.6WLZ	Yes	Y		DL	1.2	WLZ	1.6						
2	1.2DL-1.6WLZ	Yes	Y		DL	1.2	WLZ	-1.6						
3	1.2DL+1.6WLX	Yes	Y		DL	1.2	WLX	1.6						
4	1.2DL-1.6WLX	Yes	Y		DL	1.2	WLX	-1.6						

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N32	max	496.766	3	474.3	3	712.393	1	-19.677	2	1723.901	1	46.771	3
2		min	-266.16	4	309.768	4	-786.372	2	-164.298	1	-1659.098	2	-64.263	4
3	N31	max	268.359	3	473.133	4	802.175	1	-15.438	1	1674.167	1	46.666	4
4		min	-498.965	4	308.601	3	-728.197	2	-167.707	2	-1728.615	2	-63.519	3

Envelope Joint Reactions (Continued)

Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
5	Totals:	max	765.125	3	782.901	1	1514.568	1					
6		min	-765.125	4	782.901	2	-1514.569	2					

Envelope Joint Displacements

Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation ...	LC	Y Rotation ...	LC	Z Rotation [...]	LC	
1	N1	max	.003	2	-.079	1	1.094	2	2.457e-3	1	2.337e-2	2	1.306e-3	4
2		min	-.002	1	-.094	2	-1.103	1	-2.11e-3	2	-2.337e-2	1	1.643e-4	3
3	N2	max	.002	2	-.002	4	.019	2	1.252e-4	4	5.17e-3	2	5.734e-4	3
4		min	-.002	1	-.002	3	-.019	1	4.273e-6	3	-5.185e-3	1	3.257e-4	4
5	N3	max	.002	2	-.043	2	.119	2	5.296e-4	2	3.422e-3	1	-4.178e-4	3
6		min	-.002	1	-.046	1	-.123	1	-2.591e-4	1	-3.468e-3	2	-5.936e-4	4
7	N4	max	.002	2	-.079	2	1.096	2	2.377e-3	2	2.324e-2	2	1.303e-3	3
8		min	-.003	1	-.093	1	-1.095	1	-2.034e-3	1	-2.344e-2	1	1.678e-4	4
9	N5	max	.002	2	-.002	3	.018	2	1.26e-4	3	5.152e-3	2	5.749e-4	4
10		min	-.002	1	-.002	4	-.019	1	4.407e-6	4	-5.164e-3	1	3.25e-4	3
11	N6	max	.002	2	-.043	1	.123	2	5.302e-4	1	3.467e-3	1	-4.171e-4	4
12		min	-.002	1	-.046	2	-.119	1	-2.59e-4	2	-3.42e-3	2	-5.944e-4	3
13	N7	max	.003	2	-.075	1	.954	2	2.457e-3	1	2.336e-2	2	1.306e-3	4
14		min	-.002	1	-.088	2	-.962	1	-2.11e-3	2	-2.337e-2	1	1.637e-4	3
15	N8	max	.002	2	-.075	2	.957	2	2.377e-3	2	2.324e-2	2	1.303e-3	3
16		min	-.003	1	-.088	1	-.955	1	-2.034e-3	1	-2.344e-2	1	1.673e-4	4
17	N9	max	.002	2	-.04	2	.098	2	5.296e-4	2	3.422e-3	1	-4.172e-4	3
18		min	-.002	1	-.043	1	-.102	1	-2.591e-4	1	-3.467e-3	2	-5.93e-4	4
19	N10	max	.002	2	-.04	1	.102	2	5.302e-4	1	3.466e-3	1	-4.165e-4	4
20		min	-.002	1	-.043	2	-.098	1	-2.59e-4	2	-3.419e-3	2	-5.938e-4	3
21	N11	max	.018	2	-.002	4	.019	2	1.252e-4	4	5.17e-3	2	5.734e-4	3
22		min	-.018	1	-.002	3	-.019	1	4.273e-6	3	-5.185e-3	1	3.257e-4	4
23	N12	max	.018	2	-.002	3	.018	2	1.26e-4	3	5.152e-3	2	5.749e-4	4
24		min	-.018	1	-.002	4	-.019	1	4.407e-6	4	-5.164e-3	1	3.25e-4	3
25	N13	max	.073	2	-.082	3	.954	2	2.457e-3	1	2.336e-2	2	1.306e-3	4
26		min	-.072	1	-.082	4	-.962	1	-2.11e-3	2	-2.337e-2	1	1.637e-4	3
27	N14	max	.072	2	-.082	3	.957	2	2.377e-3	2	2.324e-2	2	1.303e-3	3
28		min	-.073	1	-.082	4	-.955	1	-2.034e-3	1	-2.344e-2	1	1.673e-4	4
29	N15	max	.008	1	-.042	4	.098	2	5.296e-4	2	3.422e-3	1	-4.172e-4	3
30		min	-.008	2	-.042	3	-.102	1	-2.591e-4	1	-3.467e-3	2	-5.93e-4	4
31	N16	max	.008	1	-.042	4	.102	2	5.302e-4	1	3.466e-3	1	-4.165e-4	4
32		min	-.008	2	-.042	3	-.098	1	-2.59e-4	2	-3.419e-3	2	-5.938e-4	3
33	N17	max	.024	2	-.002	4	.018	2	1.252e-4	4	5.17e-3	2	5.674e-4	3
34		min	-.013	1	-.002	3	-.02	1	4.273e-6	3	-5.185e-3	1	3.317e-4	4
35	N18	max	.093	2	-.082	3	1.021	2	3.294e-3	1	2.336e-2	2	1.702e-3	4
36		min	-.057	1	-.082	4	-1.038	1	-2.947e-3	2	-2.337e-2	1	-2.334e-4	3
37	N19	max	-.005	1	-.042	4	.086	2	4.818e-4	2	3.422e-3	1	-4.649e-4	3
38		min	-.02	2	-.042	3	-.097	1	-2.113e-4	1	-3.467e-3	2	-5.452e-4	4
39	N20	max	.013	2	-.002	3	.02	2	1.26e-4	3	5.152e-3	2	5.689e-4	4
40		min	-.024	1	-.002	4	-.018	1	4.407e-6	4	-5.164e-3	1	3.309e-4	3
41	N21	max	.057	2	-.082	3	1.031	2	3.214e-3	2	2.324e-2	2	1.7e-3	3
42		min	-.093	1	-.082	4	-1.021	1	-2.872e-3	1	-2.344e-2	1	-2.298e-4	4
43	N22	max	.02	1	-.042	4	.097	2	4.825e-4	1	3.466e-3	1	-4.643e-4	4
44		min	.005	2	-.042	3	-.086	1	-2.112e-4	2	-3.419e-3	2	-5.461e-4	3
45	AHLOA	max	.019	2	-.002	3	.02	2	1.435e-4	1	5.157e-3	2	1.197e-4	4
46		min	-.016	1	-.002	4	-.02	1	-1.598e-4	2	-5.169e-3	1	-2.063e-4	3
47	AHFIG	max	.016	2	-.002	4	.02	2	1.415e-4	2	5.166e-3	2	1.196e-4	3
48		min	-.02	1	-.002	3	-.02	1	-1.583e-4	1	-5.179e-3	1	-2.066e-4	4
49	N25	max	.002	2	0	1	0	2	5.766e-5	2	7.696e-4	2	2.299e-5	3
50		min	-.002	1	0	2	0	1	2.204e-5	1	-7.454e-4	1	-1.09e-5	4



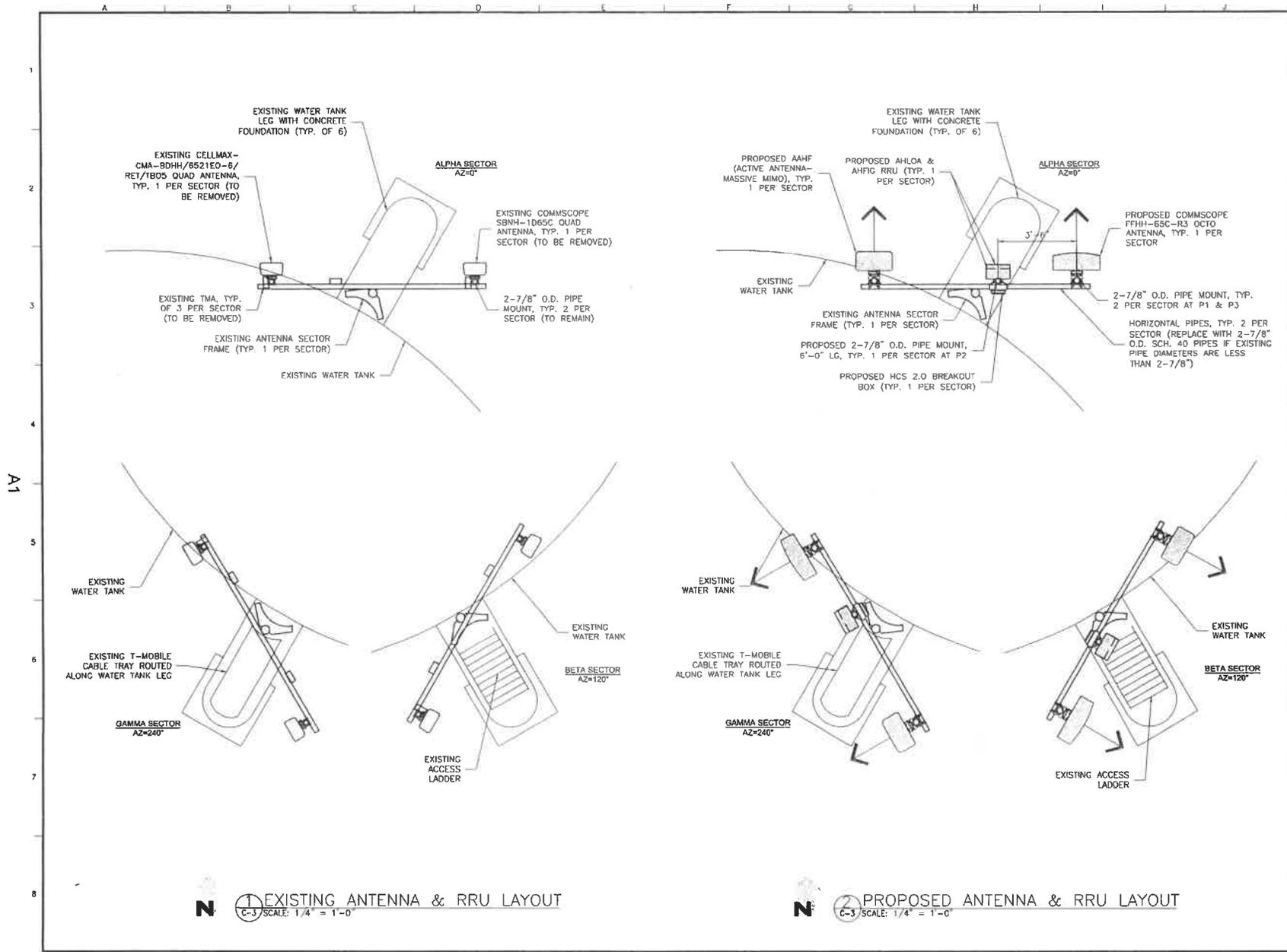
Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation ...	LC	Y Rotation ...	LC	Z Rotation [...]	LC
51	N26	max	.002	2	0	4	0	2	5.655e-5	1	7.387e-4	2	2.336e-5	4
52		min	-.002	1	0	3	0	1	2.352e-5	2	-7.675e-4	1	-1.099e-5	3
53	N27	max	0	4	0	3	0	2	5.766e-5	2	7.696e-4	2	2.299e-5	3
54		min	0	3	0	4	0	1	2.204e-5	1	-7.454e-4	1	-1.09e-5	4
55	N28	max	0	4	0	4	0	2	5.655e-5	1	7.387e-4	2	2.336e-5	4
56		min	0	3	0	3	0	1	2.352e-5	2	-7.675e-4	1	-1.099e-5	3
57	N29	max	0	4	0	4	0	2	4.292e-6	2	0	4	4.292e-6	3
58		min	0	3	0	1	0	1	-4.292e-6	1	0	1	-4.292e-6	4
59	N30	max	0	4	0	4	0	2	4.292e-6	1	0	4	4.292e-6	4
60		min	0	3	0	1	0	1	-4.292e-6	2	0	1	-4.292e-6	3
61	N31	max	0	4	0	4	0	4	0	4	0	4	0	4
62		min	0	1	0	1	0	1	0	1	0	1	0	1
63	N32	max	0	4	0	4	0	4	0	4	0	4	0	4
64		min	0	1	0	1	0	1	0	1	0	1	0	1
65	65C1	max	.064	2	-.082	3	.993	2	3.208e-3	2	2.324e-2	2	1.694e-3	3
66		min	-.083	1	-.082	4	-.986	1	-2.866e-3	1	-2.344e-2	1	-2.239e-4	4
67	65C2	max	.083	2	-.082	3	.986	2	3.288e-3	1	2.336e-2	2	1.696e-3	4
68		min	-.065	1	-.082	4	-.999	1	-2.941e-3	2	-2.337e-2	1	-2.274e-4	3
69	AAHF	max	.008	1	-.042	4	.108	2	6.414e-5	4	3.444e-3	1	2.312e-4	2
70		min	-.008	2	-.042	3	-.108	1	6.32e-5	3	-3.443e-3	2	2.309e-4	1
71	BOB	max	.017	2	-.002	1	.021	2	-1.951e-5	1	5.161e-3	2	-2.06e-4	2
72		min	-.017	1	-.002	2	-.021	1	-4.587e-5	2	-5.174e-3	1	-2.096e-4	1

Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code ...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	phi*Pnc...	phi*Pnt ...	phi*Mn ...	phi*Mn ...	Cb	Eqn
1	M1	PIPE 2.5	.607	5.417	2	.079	5	2	22373.4...	50715	3596.25	3596.25	1...	H1-1b
2	M2	PIPE 2.5	.614	5.417	1	.082	5	1	22373.4...	50715	3596.25	3596.25	1...	H1-1b
3	M9	PIPE 2.5	.131	6	1	.028	6	2	30038.4...	50715	3596.25	3596.25	1...	H1-1b
4	M10	PIPE 2.5	.060	1	4	.012	1	1	37773.8...	50715	3596.25	3596.25	1...	H1-1b
5	M11	PIPE 2.5	.060	2	3	.010	2	3	30038.4...	50715	3596.25	3596.25	1...	H1-1b
6	M14	PIPE 2.5	.363	.936	2	.594	.936	2	37807.1...	50715	3596.25	3596.25	4...	H3-6

APPENDIX



1 EXISTING ANTENNA & RRU LAYOUT
 SCALE: 1/4" = 1'-0"

2 PROPOSED ANTENNA & RRU LAYOUT
 SCALE: 1/4" = 1'-0"



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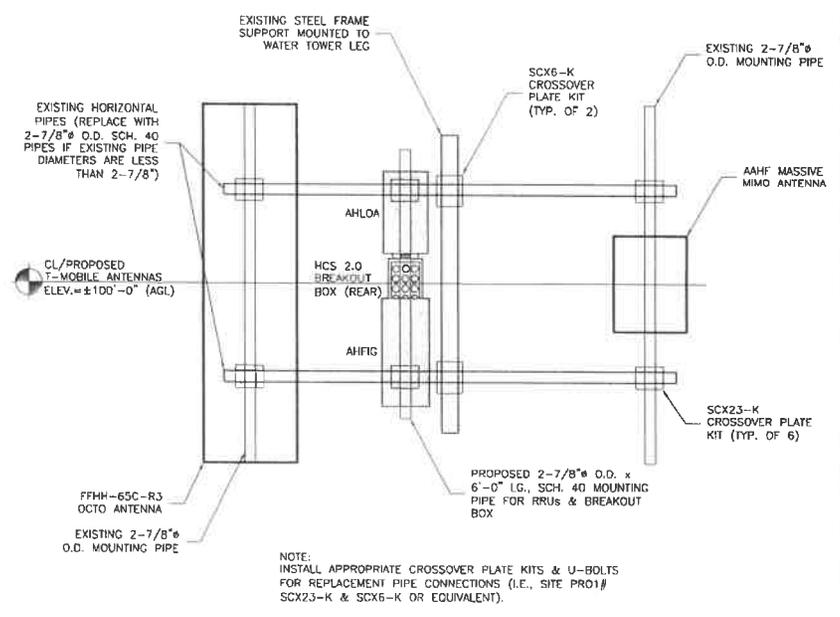
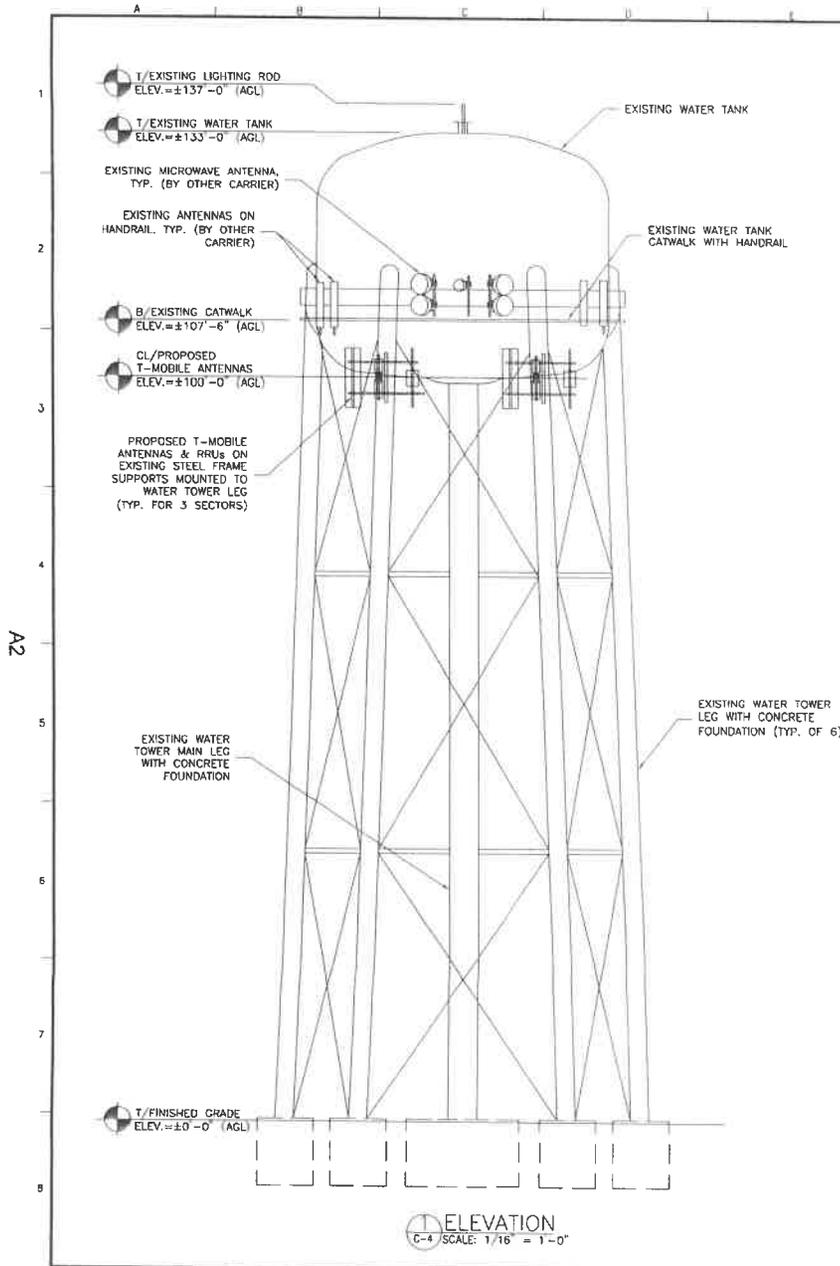
REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/19/20

CH42545B
LA GRANGE PARK WATER TANK
 137 BARNSDALE RD
 LA GRANGE PARK, IL 60525

ANTENNA & RRU LAYOUT

Project Number	Sheet Title
Client/Project Name	Revision No. RA
Date	Revised By RA
Drawn	Revised By RA
Checked	Revised By RA

Sheet Number: **C-3**



2 ANTENNA & RRU MOUNTING DETAIL
 C-4 SCALE: 3/8" = 1'-0"

T-Mobile

1400 OPUS PLACE, SUITE 700
 DOWNERS GROVE, IL 60515
 PHONE: 630-490-8800 FAX: 630-490-8222
 WWW.T-MOBILE.COM

KCS CORPORATION
 CONSULTING ENGINEERS

ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.000930
 1125 REBURNING RD., SCHANBERG, IL 60273
 PHONE: 630-490-8800 FAX: 630-490-8222
 WWW.KCSGROUP.COM

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0	ISSUED FOR PERMIT	5/24/20
A	ISSUED FOR REVIEW	6/15/20

CH42545B
LA GRANGE PARK WATER TANK
 837 BARRISDALE RD
 LA GRANGE PARK, IL 60526

Drawing Title:
ELEVATION

Project Number:	Drawn by: JLS
Client Project Number:	Checked by: JLS
Date:	Approved by: JLS
Drawing Number:	Date:

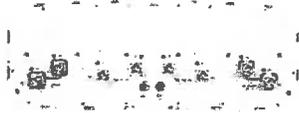
C-4

Product Specifications

COMMSCOPE®

FFHH-65C-R3

8-port sector antenna, 4x 617-806 and 4x 1695-2360 MHz, 65° HPBW, 3x RET, 600 MHz-Ready Antenna Technology



Electrical Specifications

Frequency Band, MHz	617-698	698-806	1695-1880	1850-1990	1920-2200	2300-2360
Gain, dBi	15.3	15.5	17.8	18.3	19.1	19.7
Beamwidth, Horizontal, degrees	67	63	66	65	63	55
Beamwidth, Vertical, degrees	10.2	9.1	5.6	5.2	4.9	4.4
Beam Tilt, degrees	2-13	2-13	2-12	2-12	2-12	2-12
USLS (First Lobe), dB	19	18	18	18	18	19
Front-to-Back Ratio at 180°, dB	32	29	36	38	39	39
CPR at Sector, dB				8		
Isolation, dB	28	28	28	28	28	28
Isolation, Intersystem, dB	28	28	28	28	28	28
VSWR Return Loss, dB	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	300	300	300	300	300	250
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm					

Electrical Specifications, BASTA*

Frequency Band, MHz	617-698	698-806	1695-1880	1850-1990	1920-2200	2300-2360
Gain by all Beam Tilts, average, dBi	15.0	15.2	17.5	18.0	18.6	19.3
Gain by all Beam Tilts Tolerance, dB	±0.6	±0.5	±0.5	±0.5	±0.6	±0.6
	2 ° 14.8	2 ° 15.0	2 ° 17.3	2 ° 17.8	2 ° 18.2	2 ° 18.8
Gain by Beam Tilt, average, dBi	8 ° 15.1	8 ° 15.3	7 ° 17.6	7 ° 18.1	7 ° 18.7	7 ° 19.4
	13 ° 15.0	13 ° 15.1	12 ° 17.6	12 ° 17.9	12 ° 18.5	12 ° 19.2
Beamwidth, Horizontal Tolerance, degrees	±2.7	±4.8	±5.9	±5.6	±5.6	±6.9
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.7	±0.4	±0.4	±0.4	±0.2
USLS, beampeak to 20° above beampeak, dB	17	13	15	15	16	16
Front-to-Back Total Power at 180° ± 30°, dB	23	21	29	31	31	30
CPR at Boresight, dB	24	23	19	18	20	21
CPR at Sector, dB	6	10	8		9	8

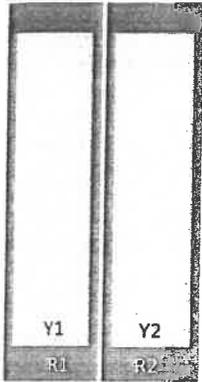
* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

Array Layout

Product Specifications

COMMSCOPE®

FFHH-65C-R3

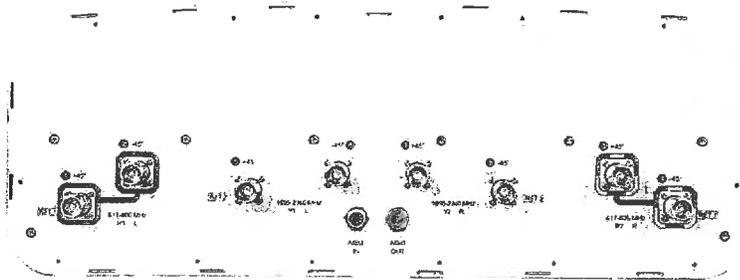


Left Bottom Right

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	617-806	1-2	1	ANxxxxxxxxxxxxxxxxx1
R2	617-806	3-4		
Y1	1695-2360	5-6	2	ANxxxxxxxxxxxxxxxxx2
Y2	1695-2360	7-8	3	ANxxxxxxxxxxxxxxxxx3

(Sizes of colored boxes are not true depictions of array sizes)

Port Configuration



General Specifications

Operating Frequency Band	1695 – 2360 MHz 617 – 806 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage
Total Input Power, maximum	900 W @ 50 °C

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4

Product Specifications

COMMSCOPE®

FFHH65CR3

RF Connector Interface	4.3-10 Female
Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	1925.0 N @ 150 km/h 432.8 lbf @ 150 km/h
Wind Loading, lateral	351.0 N @ 150 km/h 78.9 lbf @ 150 km/h
Wind Loading, rear	1945.0 N @ 150 km/h 437.3 lbf @ 150 km/h
Wind Speed, maximum	241 km/h 150 mph

Dimensions

Length	2437.0 mm 95.9 in
Width	640.0 mm 25.2 in
Depth	235.0 mm 9.3 in
Net Weight, without mounting kit	57.9 kg 127.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (2) Low band (1)
Power Consumption, idle state, maximum	1 W
Power Consumption, normal conditions, maximum	10 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female 8-pin DIN Male
RET Interface, quantity	1 female 1 male

Packed Dimensions

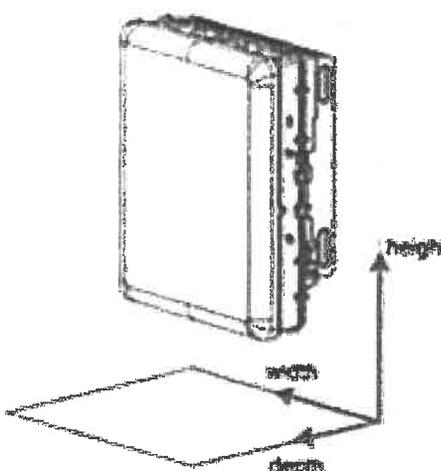
Length	2590.0 mm 102.0 in
Width	752.0 mm 29.6 in
Depth	380.0 mm 15.0 in
Shipping Weight	84.4 kg 186.1 lb

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

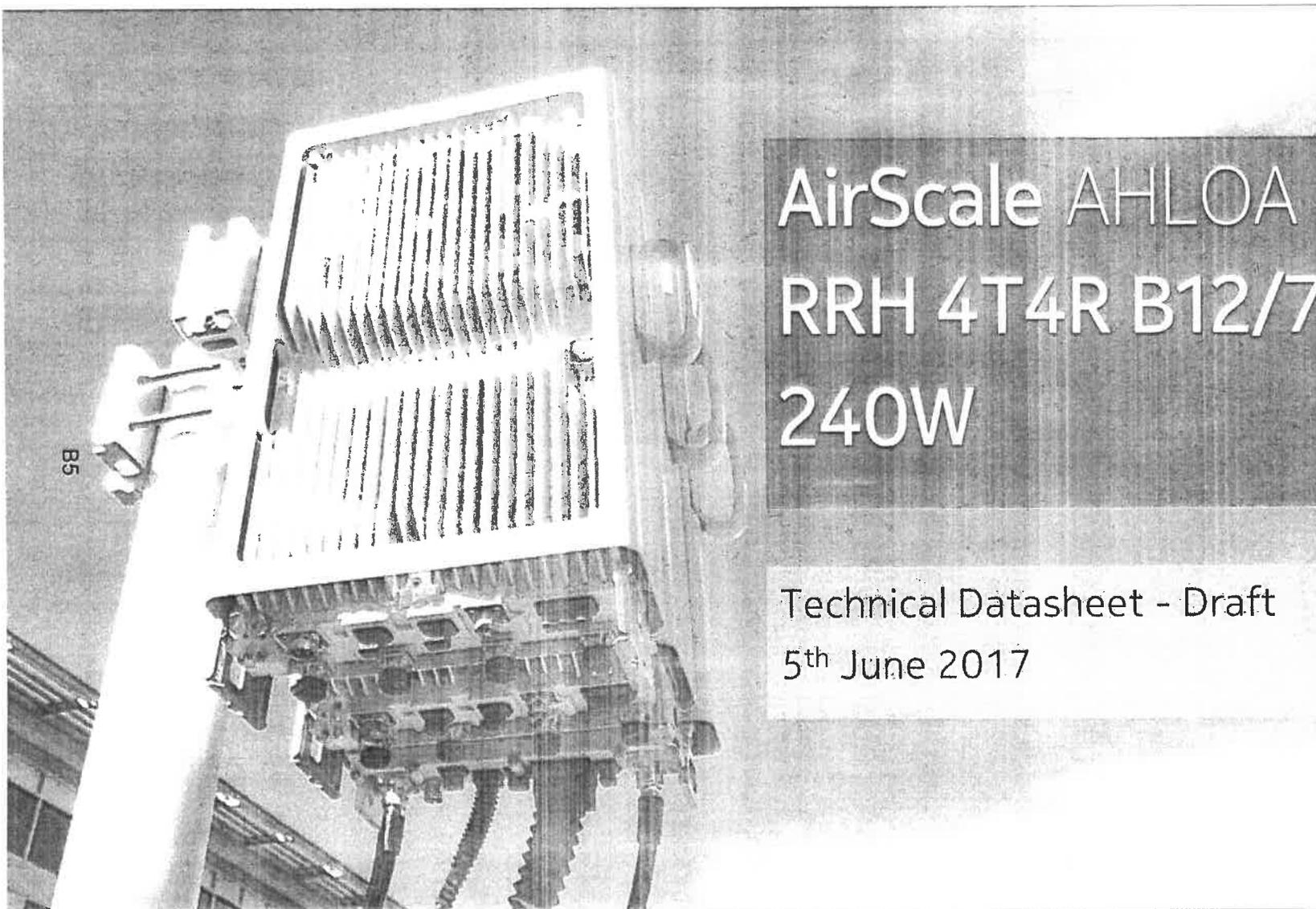


PRODUCT DESCRIPTION

Band	B41 – 2496-2690 MHz	
Supported Modulation schemes	(DL) BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM (UL) BPSK, QPSK, 16 QAM, 64 QAM	
No. of ports	32TX32RX and 64TX64RX	
MIMO Streams	16	
Instantaneous IBW	60MHz on Band 41	
Total Avg EIRP	74.8 dBm	
Supported bandwidths	LTE 1.4,3,5,10,15,20 MHz	
Output Power	120W Total (3x40W)	
B4 Power Consumption	850 W typical (ETSI average)	
Optical Ports	3 x QSFP+ (each 4* Gbps CPRI)	
Connector Type	DC -40.5V ... -57V/2 Pole connector	
Installation Options	4.3-10+	
AISG	AISG on all ports, DC on ANT1 and ANT3	
Dimensions (H x W x D)	25.6 x 10.3 x 19.7	
Weight lbs	103.6 lb	
HW/SW Availability	Sept'19 – SRAN19A	
5G NR Support	YES B4	
Material Description	AAHF AirScale2 Dual RRH 4T4R B25/66 480W	AAHF 474715A

AirScale AHLOA RRH 4T4R B12/71 240W

Technical Datasheet - Draft
5th June 2017



AirScale Dual RRH 4T4R B12/71 240W AHLOA (Draft)



2 © Nokia 2017

Product Code: 474331A	
Supported Frequency bands	3GPP Band 12/71
Frequencies	Band 12 adjusted: Rx 698 – 715 MHz, TX 728 – 745 MHz Band 71: RX 663 MHz – 698 MHz, TX 617 MHz – 652 MHz
Number of TX/RX paths/pipes	4 pipes; 2T2R, 2T4R, 4T4R for both bands
Instantaneous Bandwidth IBW	16 MHz for B12 and 35MHz for B71 1 MHz below B12 NB IoT future use
Occupied Bandwidth OBW	52 MHz total across bands
Output Power	60W per TX shared between bands
Supply Voltage / Range	DC-48 V / -36 V to -60 V
Typical Power Consumption	664W [ETSI Busy Hour Load at 4TX@60W (Both Bands Active)] 395W [ETSI Busy Hour Load at 4TX@30W (One Band Active)]
Antenna Ports	4 ports, 4.3-10+
Optical Ports	2 x CPRI 9.8 Gbps
ALD Control Interfaces	AISG3.0 from ANT1, 2, 3, 4 and RET (DC on ANT1 & ANT3)
Other Interfaces	External Alarm MDR-26 Serial connector (4 inputs, 1 Output) DC Circular Power Connector
Physical	560 mm x 308 mm x 189 mm Approximately 38kg with no covers or brackets
Operating Temperature Range	-40°C to 55°C (with no solar load)
Surge Protection	Class II 5A
Installation Options	Vertical & Horizontal Book Mount, Pole & Wall Mount

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LTE5213/SR002411: Nokia Airscale Dual RRH 4T4R B25/B66 Module AHFIG

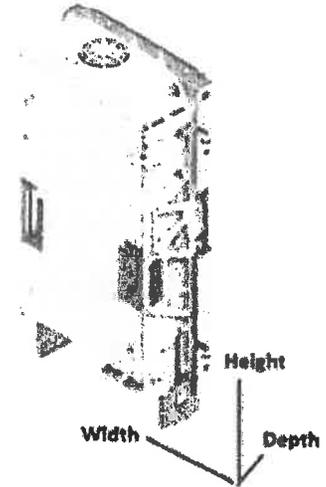
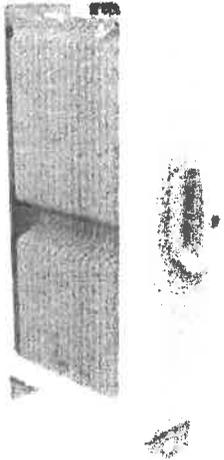
Description

LTE5213/SR002411: Nokia AirScale Dual RRH 4T4R B25/66 480 W AHFIG feature in release LTE19A/SRAN19A introduces the new Nokia AirScale Multiband Remote Radio Head with four transmitters and four receivers for 3GPP Band 25 and Band 66 enabling it to support one sector and two bands simultaneously with up to 4x40 W for B66 and 4x80 W for B25 at the antenna connector.

AHFIG is an updated version of the AHFIB with an improvement in the output PA power for B25 to 4x80 W as compared to 4x40 W in AHFIB. Output PA power for B66 is same as AHFIB (4x40 W).

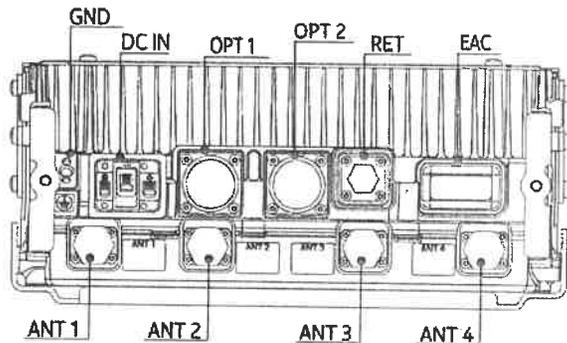
This radio can be used in LTE only or LTE/WCDMA/GSM using the SRAN functionality. Classical RF sharing with WCDMA or GSM is not supported with this radio. The AHFIG radio will work only with AirScale system module. The AHFIG is a 5G capable radio.

The AHFIG is a 4TX/4RX RRH for Band 25 and Band 66. There are four ports on the RRH. It is a one sector radio optimized for macro BTS installations.



AHFIG Interfaces

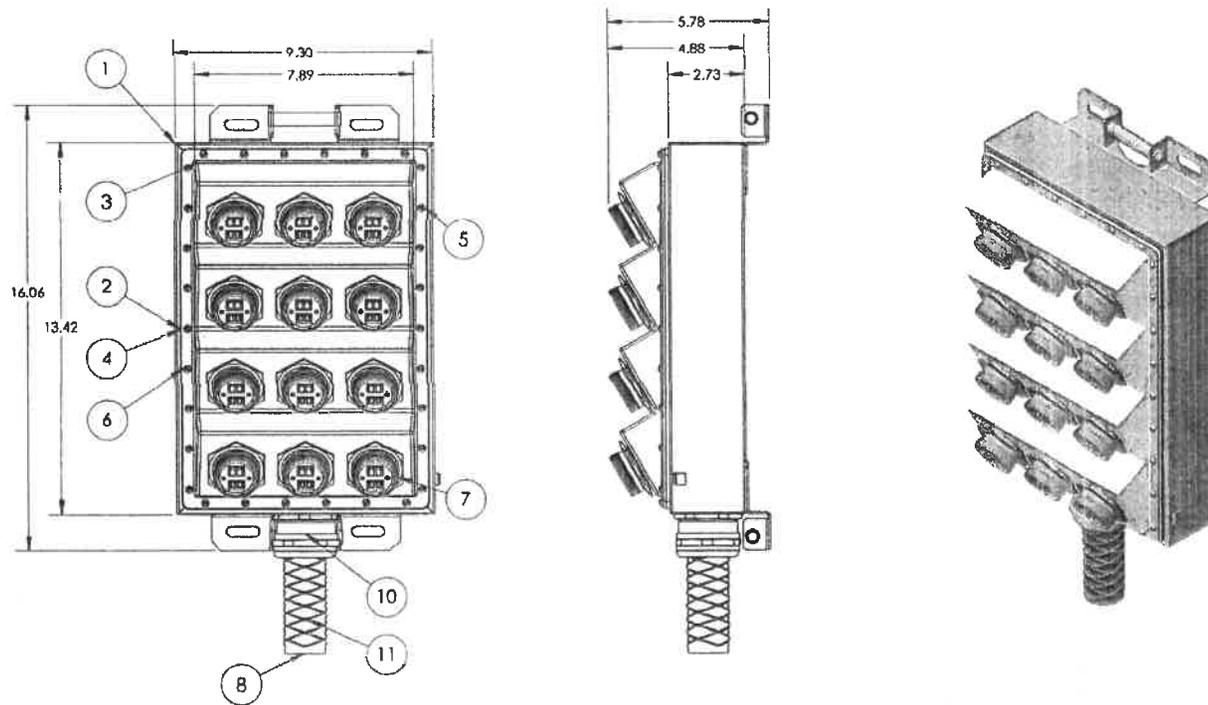
The ports of the AHFIG are shown below



Dimensions and Weight

Property	Value
Height	Core RRH: 695 mm (27.4 in.) With upper and lower mounting brackets: 730 mm (28.7 in.)
Width	Core RRH: 308 mm (12.1 in.) With mounting cover: 327 mm (12.9 in.)
Depth	Core RRH: 131 mm (5.2 in.) With mounting cover: 142 mm (5.6 in.)
Weight	Core RRH: 32 kg (70.5 lb)

B9



ITEM NO.	PART NUMBER	DESCRIPTION	AC-DIST08-6IP-SHIR/QTY.
1	AC-DIST05-24IP-DC	IP SHEETMETAL BOX	1
2	AC-GKT05-FB-HICAP	GASKET EPDM	1
3	AC-FB-FRONT-4STEP-3CON	HYBRID MODULE INCLINE MOUNT THERMO SHELL	1
4	AC-STR05-HICAP	METAL O-RING	1
5	Regular LW 0.125	WASHER	30
6	3GMRB06058	TAMPERED PROOF #6-32 SCREW	30
7	CF-970850-101_106_W/LC	JAM NUT RECEPTACLE	12
8	ASU9325TYP02	HYBRID CABLE HI-CAP	1
9	6000428	LOCKNUT FOR CABLE GLAND	1
10	4220342	CABLE GLAND	1
11	HOIST GRIP	CABLE HOIST GRIP	1

NOTE:
1. TOTAL VOLUME IS Max 480.6 CUBIC INCH.

CUSTOMER APPROVAL

NAME:

SIGNATURE:

DATE:



THE POWER OF BEING CONNECTED.

SIGNATURE CYCLE DATE

DRAWN: HSHIN 20170526

CHECKED: DOB 20170526

APPROVED: DOB 20170526

DIM: ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE SPECIFIED.

DESCRIPTION:

HYBRID CABLE HI-CAP
BREAKOUT BOXMATERIAL: AS PER SPECIFIED
REQUIREMENTS

WEIGHT 3.59

FINISH:

COLOUR:

SHEET NO: 1 OF 1

DWG NO:

AC-HCS05-HICAP-24IP

SCALE:

TOLERANCE: X.X ± 0.020"
X.XX ± 0.010"
X.XXX ± 0.005"

DISCLAIMER

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REVIEWED BY:

PROPERTY OWNER OR REP.	RF
ZONING	NETWORK
CONSTRUCTION	CONTRACTOR
OPERATIONS	SITE ACQUISITION

- SCOPE OF WORK**
- REMOVAL OF DECOMMISSIONED EQUIPMENT & SYSTEM MODULES ON EQUIPMENT PAD.
 - INSTALLATION OF (2) LARGE DELTA GEN 3 CABINETS (SSC & BBU) AT EQUIPMENT PAD. INSTALLATION OF (2) AMIAs, (3) ABIAs, (1) FSMF AND OTHER SYSTEM MODULES INSIDE THE SSC.
 - INSTALLATION OF (2) BOTTOM OVPS ON THE EQUIPMENT PAD.
 - REMOVAL OF DECOMMISSIONED ANTENNAS, RRUS AND COAX CABLES ON TOP OF THE WATER TANK.
 - INSTALLATION OF NEW 2-7/8"x6'-0" MOUNTING PIPES AT STEEL ANTENNA SUPPORT FRAME PER SECTOR. REPLACEMENT OF STEEL FRAME HORIZONTAL PIPES AS NEEDED.
 - INSTALLATION OF (3) OCTO ANTENNAS, (3) AAHF MASSIVE MIMO ANTENNAS, (3) BREAKOUT BOXES/PENDANTS, AND (6) RRUs ON EXISTING STEEL ANTENNA SUPPORT FRAMES ON WATER TANK LEGS.
 - INSTALLATION OF (2) HCS 2.0 CABLES FROM EQUIPMENT PAD OVPS TO SECTOR BREAKOUT BOXES/PENDANTS ON WATER TANK ROOF. HCS CABLES TO FOLLOW ROUTE OF DECOMMISSIONED COAX CABLES.
 - INSTALLATION OF HYBRID JUMPER CABLES FROM BREAKOUT BOXES TO RRUs.
 - INSTALLATION OF RF JUMPER CABLES FROM RRUs TO ANTENNAS.
 - INSTALLATION OF GROUNDING WIRES FOR NEW ANTENNAS & RRUs.

SHEET INDEX

SHEET NO:	SHEET TITLE	REV. NO:
T-1	TITLE SHEET	0
C-1	OVERALL SITE PLAN	0
C-2	EXISTING & PROPOSED GROUND EQUIPMENT PLAN	0
C-3	EXISTING & PROPOSED EQUIPMENT LAYOUT AT WATER TANK ROOF	0
C-4	ELEVATION, ANTENNA & RRU MOUNTING DETAIL	0
C-5	ANTENNA & CABLE SCHEDULE	0
C-6	ANTENNA & EQUIPMENT INFORMATION	0
C-7	EQUIPMENT INFORMATION	0
C-8	EQUIPMENT INFORMATION	0
C-9	EQUIPMENT INFORMATION	0
C-10	RF DATA CONFIGURATION SHEET	0
E-1	ELECTRICAL NOTES, CABLE ROUTING PLANS	0
E-2	GROUNDING NOTES, GROUNDING PLAN	0
E-3	GROUNDING DETAILS	0
N-1	NOTES	0
N-2	NOTES	0

NOTES FOR CONTRACTOR

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED IN FIELD. IF SIGNIFICANT DEVIATIONS OR DETERIORATION ARE ENCOUNTERED AT THE TIME OF CONSTRUCTION, A REPAIR PERMIT WILL BE OBTAINED AND CONTRACTOR SHALL NOTIFY STRUCTURAL ENGINEER IMMEDIATELY.

T-Mobile®

SITE NAME
LA GRANGE PARK WATER TANK

SITE NUMBER
CH42545B

SITE ADDRESS
**937 BARNSDALE RD,
LA GRANGE PARK, IL 60526**

PROJECT TYPE
**ANCHOR -
INSTALLATION OF (6) NEW ANTENNAS & (6) RRUS TO STEEL
FRAMES ON THE WATER TANK LEGS AND UPGRADE OF
GROUND EQUIPMENT INSIDE LEASE AREA**

GEOGRAPHIC COORDINATES (NAD 83)

LATITUDE: 41° 49' 55.10" N
LONGITUDE: 87° 51' 56.10" W

PROJECT SUMMARY

APPLICABLE CODES

- INTERNATIONAL BUILDING CODE, LATEST EDITION
- NATIONAL ELECTRICAL CODE, LATEST EDITION

APPLICANT

T-MOBILE L.L.C.
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

CONSTRUCTION CONTACT: CHRISTOPHER LYTLE
PHONE NO.:

OPERATIONAL CONTACT:
PHONE NO.:

UTILITIES

POWER:

TELEPHONE:

UNDERGROUND SERVICE ALERT
CALL TOLL FREE
1-800-892-0123
THREE WORKING DAYS BEFORE YOU DIG

CONTRACTOR

PROFESSIONAL LICENSE

I HEREBY CERTIFY THAT THESE PLANS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS


 SEEMESH M. SETHI
0062-051290

SIGNATURE: _____
SIGNED: 6/24/20 EXPIRES: 11/30/21

NOTES FOR CONTRACTOR

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

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HANDICAP ACCESS REQUIREMENTS

SITE IS UNOCCUPIED AND NOT FOR HUMAN HABITATION. HANDICAP ACCESS NOT REQUIRED.

NOTES

THE DRAWINGS ARE FULL ON 11"x17" SHEET SIZE AND ARE NOT REDUCED IN SIZE U.N.O.

THESE PLANS HAVE BEEN PREPARED FOR THE PURPOSE OF DESIGN AND DETAILING OF ANY AND ALL CIVIL AND ELECTRICAL ENGINEERING ASPECT OF THIS PROJECT.

SITE DIRECTIONS

FROM T-MOBILE OFFICE:

- TAKE BUTTERFIELD FRONTAGE RD TO HIGHLAND AVE
- FOLLOW 31ST ST TO BARNSDALE RD IN LA GRANGE PARK
- TURN RIGHT ONTO BARNSDALE RD
- DESTINATION WILL BE ON THE LEFT

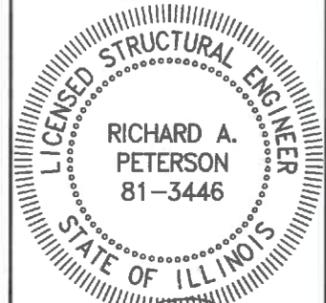


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1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

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CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
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 RICHARD A. PETERSON
81-3446

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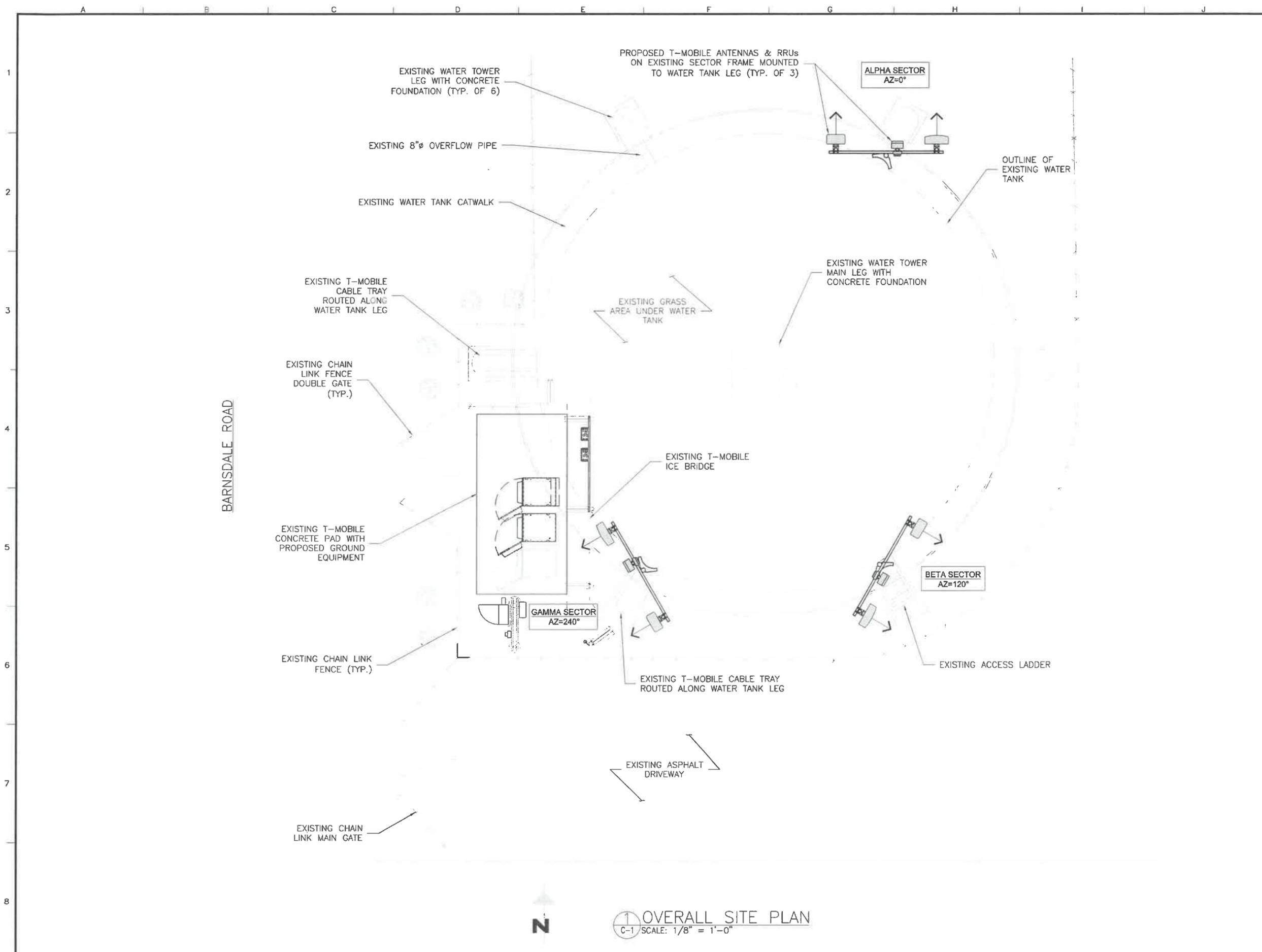
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A	ISSUED FOR REVIEW	6/15/20

CH42545B
LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
TITLE SHEET

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

T-1



T-Mobile
 1400 OPUS PLACE, SUITE 700
 DOWNERS GROVE, IL 60515
 PHONE:
 FAX:

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 CONSULTING ENGINEERS
 ILLINOIS DESIGN FIRM REGISTRATION NO.: 184-002139
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LICENSED PROFESSIONAL ENGINEER
 SEEMESH M. SETHI
 0062-051290
 STATE OF ILLINOIS
 SIGNATURES: *Seemesh M. Sethi*
 DATE: 6/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
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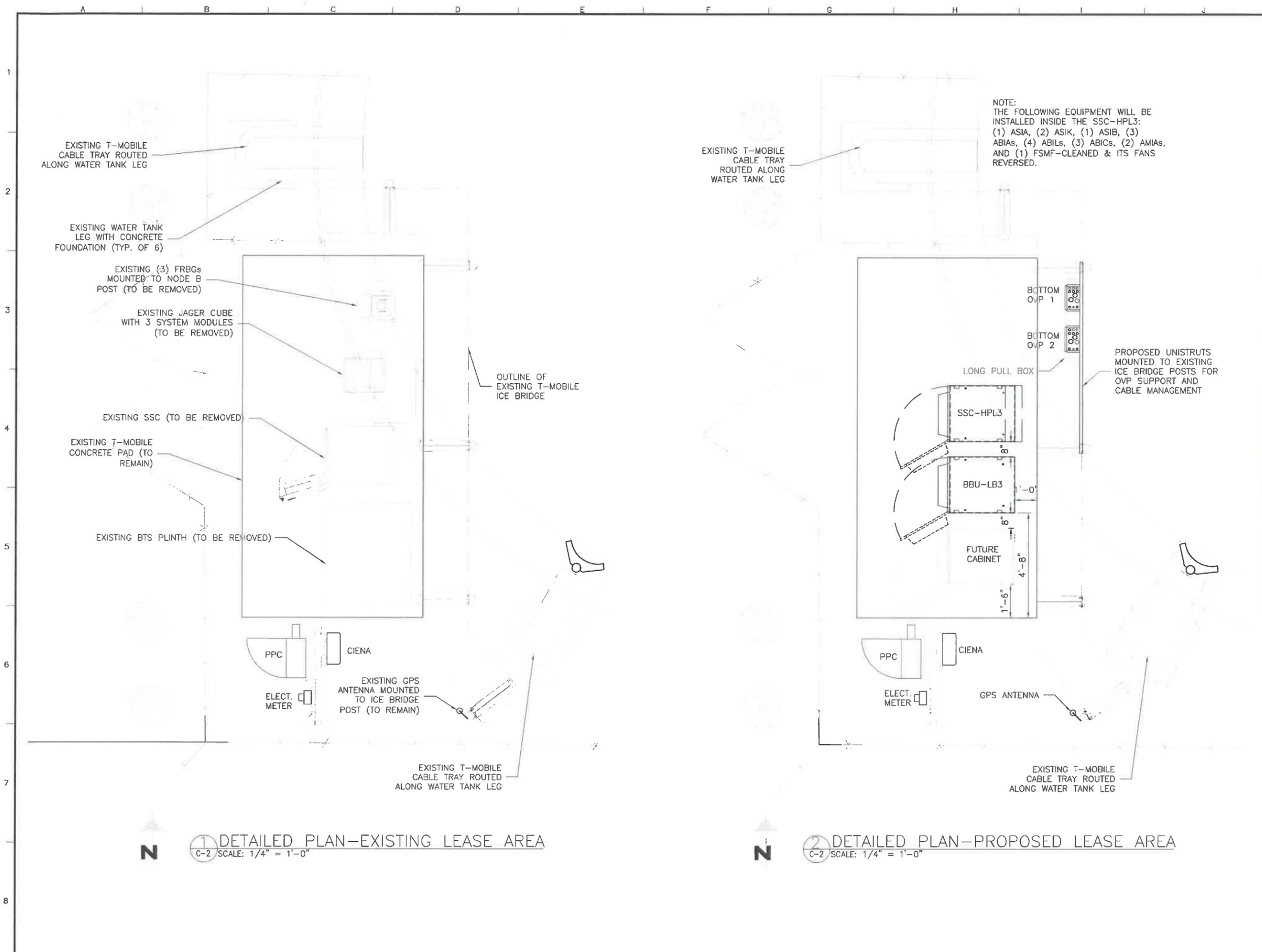
CH42545B
LA GRANGE PARK WATER TANK
 937 BARNSDALE RD
 LA GRANGE PARK, IL 60526

Drawing Title:
OVERALL SITE PLAN

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

C-1

OVERALL SITE PLAN
 C-1 SCALE: 1/8" = 1'-0"



EXISTING T-MOBILE
CABLE TRAY ROUTED
ALONG WATER TANK LEG

EXISTING WATER TANK
LEG WITH CONCRETE
FOUNDATION (TYP. OF 6)

EXISTING (3) FRBGs
MOUNTED TO NODE B
POST (TO BE REMOVED)

EXISTING JAGER CUBE
WITH 3 SYSTEM MODULES
(TO BE REMOVED)

EXISTING SSC (TO BE REMOVED)

EXISTING T-MOBILE
CONCRETE PAD (TO
REMAIN)

EXISTING BTS PLINTH (TO BE REMOVED)

PPC

CIENA

ELECT.
METER

EXISTING GPS
ANTENNA MOUNTED
TO ICE BRIDGE
POST (TO REMAIN)

EXISTING T-MOBILE
CABLE TRAY ROUTED
ALONG WATER TANK LEG

OUTLINE OF
EXISTING T-MOBILE
ICE BRIDGE

1 DETAILED PLAN-EXISTING LEASE AREA
C-2 SCALE: 1/4" = 1'-0"

EXISTING T-MOBILE
CABLE TRAY
ROUTED ALONG
WATER TANK LEG

NOTE:
THE FOLLOWING EQUIPMENT WILL BE
INSTALLED INSIDE THE SSC-HPL3:
(1) ASIA, (2) ASIK, (1) ASIB, (3)
ABIAS, (4) ABILs, (3) ABICs, (2) AMIAs,
AND (1) FSMF-CLEANED & ITS FANS
REVERSED.

BOTTOM
OVP 1

BOTTOM
OVP 2

LONG PULL BOX

SSC-HPL3

BBU-LB3

FUTURE
CABINET

PROPOSED UNISTRUTS
MOUNTED TO EXISTING
ICE BRIDGE POSTS FOR
OVP SUPPORT AND
CABLE MANAGEMENT

PPC

CIENA

ELECT.
METER

GPS ANTENNA

EXISTING T-MOBILE
CABLE TRAY ROUTED
ALONG WATER TANK LEG

2 DETAILED PLAN-PROPOSED LEASE AREA
C-2 SCALE: 1/4" = 1'-0"

T-Mobile
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DOWNERS GROVE, IL 60515
PHONE:
FAX:

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STATE OF ILLINOIS
SIGNATURES:
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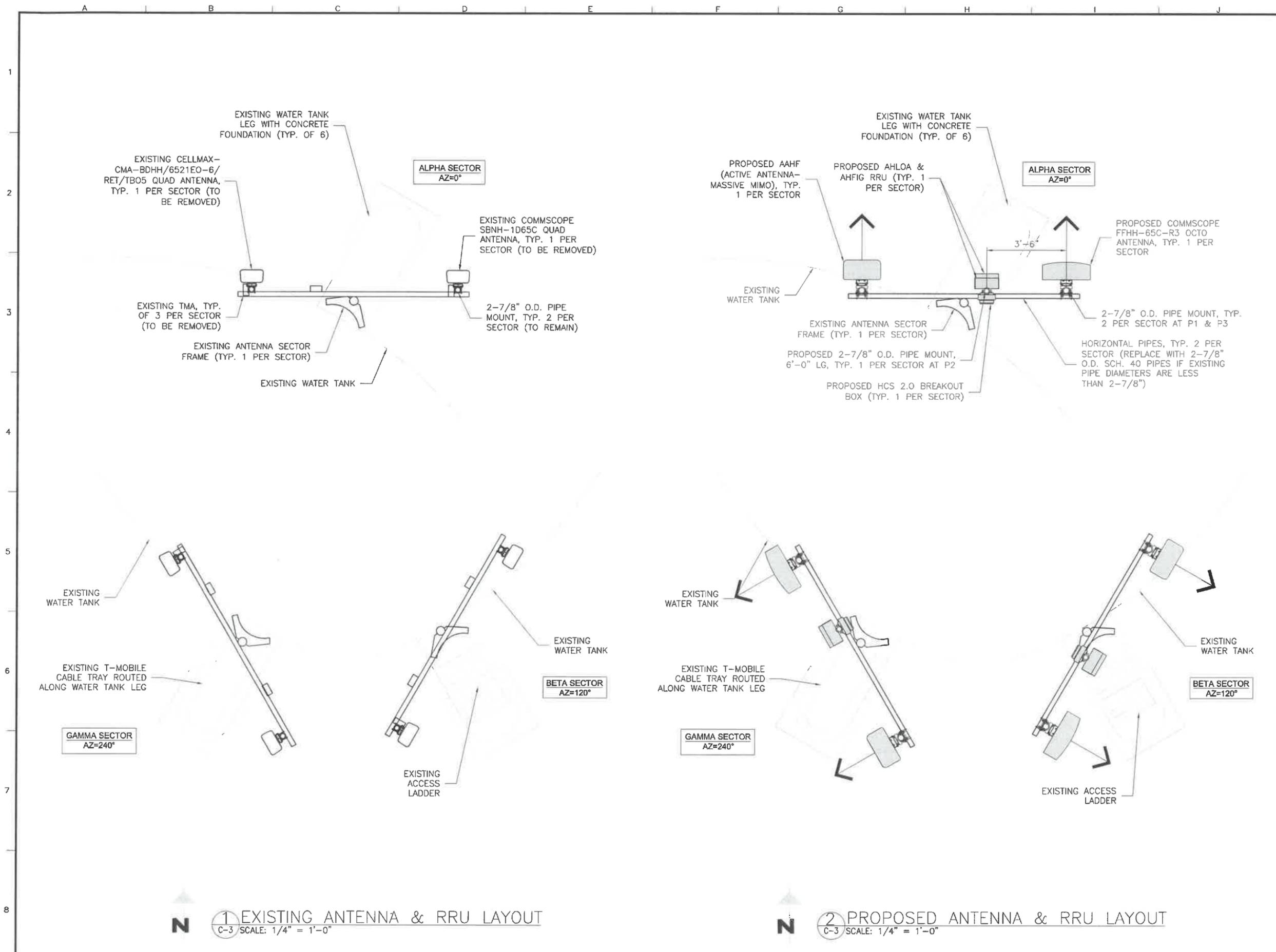
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LA GRANGE PARK WATER TANK
9.37 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
LEASE AREA, ANTENNA & RRU LAYOUT

Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:
	Approved by: MS
	Date:

C-2



1 EXISTING ANTENNA & RRU LAYOUT
 C-3 SCALE: 1/4" = 1'-0"

2 PROPOSED ANTENNA & RRU LAYOUT
 C-3 SCALE: 1/4" = 1'-0"

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 RICHARD A. PETERSON
 81-3446
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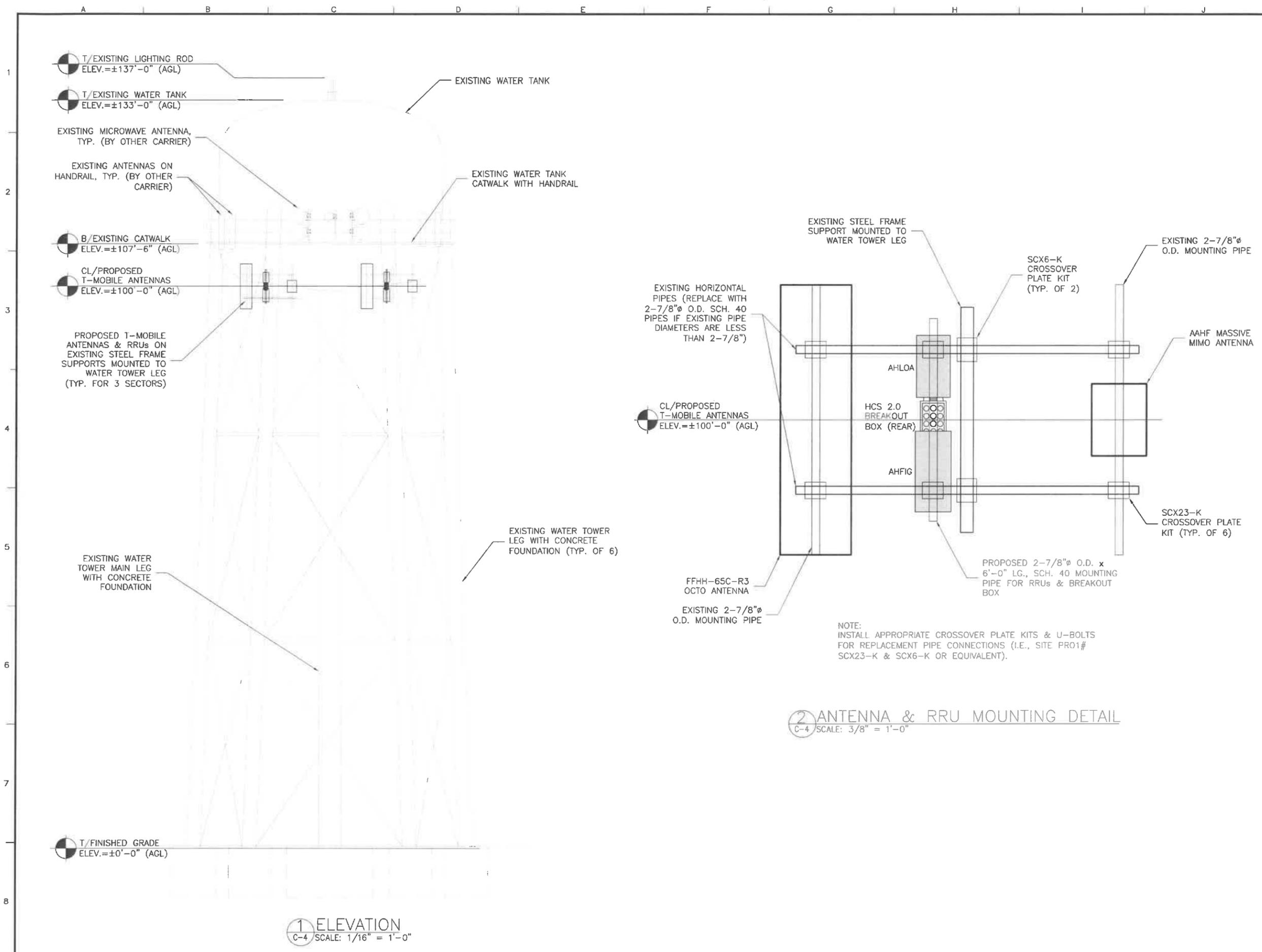
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LA GRANGE PARK WATER TANK
 937 BARNSDALE RD
 LA GRANGE PARK, IL 60526

Drawing Title:
ANTENNA & RRU LAYOUT

Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:
	Approved by: MS
	Date:

Drawing Number:
C-3



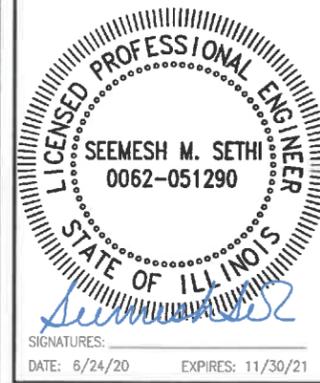
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LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
ANTENNA & CABLE SCHEDULE, HYBRID JUMPER INFORMATION

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

C-5

ANTENNA & CABLE SCHEDULE

SECTOR	1					2					3									
SECTOR NAME	ALPHA					BETA					GAMMA									
ANTENNA	1		2			1		2			1		2							
MODEL #	COMMSCOPE FFHH-65C-R3 (OCTO)				AAHF (ACTIVE ANTENNA MASSIVE MIMO)	COMMSCOPE FFHH-65C-R3 (OCTO)				AEHC (ACTIVE ANTENNA MASSIVE MIMO)	COMMSCOPE FFHH-65C-R3 (OCTO)				AEHC (ACTIVE ANTENNA MASSIVE MIMO)					
AZIMUTH	0°										120°					240°				
RAD CENTER	±100.0'										±100.0'					±100.0'				
MECH. DOWNTILT	0					0					0									
PORTS	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5					
ACTIVE TECHNOLOGY	L700 L600 N600	L700 L600 N600	U1900 L2100 L1900 G1900	U1900 L2100 L1900 G1900	L2500 N2500	L700 L600 N600	L700 L600 N600	U1900 L2100 L1900 G1900	U1900 L2100 L1900 G1900	L2500 N2500	L700 L600 N600	L700 L600 N600	U1900 L2100 L1900 G1900	U1900 L2100 L1900 G1900	L2500 N2500					
DARK TECHNOLOGY																				
ELEC. DOWNTILT	2	2	2	2		2	2	2	2		2	2	2	2						
RRU TYPE	(1) AHLOA		(1) AHFIG				(1) AHLOA		(1) AHFIG			(1) AHLOA		(1) AHFIG						
DIPLEXERS/COMBINERS					SFC4 (AT CABINET) (X2)					SFC4 (AT CABINET) (X2)					SFC4 (AT CABINET) (X2)					
CABLES																				
CABLE TYPE FROM PLATFORM BOTTOM OVP TO TOWER BREAKOUT BOX	NWS-HCS2-HC6-225: NOKIA HCS 2.0 TRUNK HICAP 12 RRU 12X4AWG CABLE					NWS-HCS2-HC6-200: NOKIA HCS 2.0 TRUNK HICAP 12 RRU 12X4AWG CABLE					NWS-HCS2-HC6-175: NOKIA HCS 2.0 TRUNK HICAP 12 RRU 12X4AWG CABLE									
HCS ACTUAL LENGTH	(1) 206.0'					(1) 183.0'					(1) 156.0'									
HCS FACTORY LENGTH	(1) 225.0'					(1) 200.0'					(1) 175.0'									
JUMPER TYPE FROM BREAKOUT BOX TO RRU	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER	HYBRID JUMPER					
ACTUAL JUMPER LENGTH	(1) 6'-0"	(1) 8'-0"	(2) 12'-0"	(1) 6'-0"	(1) 8'-0"	(2) 12'-0"	(1) 6'-0"	(1) 8'-0"	(2) 12'-0"	(1) 6'-0"	(1) 8'-0"	(2) 12'-0"	(1) 6'-0"	(1) 8'-0"	(2) 12'-0"					
FACTORY JUMPER LENGTH	(1) 15'-0"	(1) 15'-0"	(2) 15'-0"	(1) 15'-0"	(1) 15'-0"	(2) 15'-0"	(1) 15'-0"	(1) 15'-0"	(2) 15'-0"	(1) 15'-0"	(1) 15'-0"	(1) 15'-0"	(2) 15'-0"	(1) 15'-0"	(2) 15'-0"					
JUMPER TYPE FROM RRU TO ANTENNA	RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER		RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER		RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER						
JUMPER LENGTH	(2) 12'-0"	(2) 12'-0"	(2) 10'-0"	(2) 10'-0"		(2) 12'-0"	(2) 12'-0"	(2) 10'-0"	(2) 10'-0"		(2) 12'-0"	(2) 12'-0"	(2) 10'-0"	(2) 10'-0"						

Product Specifications

COMMSCOPE

Product Specifications

COMMSCOPE

Product Specifications

COMMSCOPE

FFHH-65CR3

8-port sector antenna, 4x 617-806 and 4x 1695-2360 MHz, 65° HPBW, 3x RET, 600 MHz-Ready Antenna Technology

Electrical Specifications

Frequency Band, MHz	617-698	698-806	1695-1880	1850-1990	1920-2200	2300-2360
Gain, dB	15.3	15.5	17.8	18.3	19.1	19.7
Beamwidth, Horizontal, degrees	67	63	66	65	63	55
Beamwidth, Vertical, degrees	10.2	9.1	5.6	5.2	4.9	4.4
Beam Tilt, degrees	2-13	2-13	2-12	2-12	2-12	2-12
USLS (First Lobe), dB	19	18	18	18	18	19
Front-to-Back Ratio at 180°, dB	32	29	36	38	39	39
CPR at Sector, dB			8	8	28	28
Isolation, dB	28	28	28	28	28	28
Isolation, Intersystem, dB	28	28	28	28	28	28
VSWR Return Loss, dB	1.5 14	1.5 14	1.3 14	1.5 14.0	1.3 14.0	1.3 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	300	300	300	300	300	250
Polarization	44.5°	44.5°	44.5°	44.5°	44.5°	44.5°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	617-698	698-806	1695-1880	1850-1990	1920-2200	2300-2360
Gain by all Beam TRs, average, dB	15.0	15.2	17.5	18.0	18.6	19.3
Gain by all Beam TRs Tolerance, dB	+0.6	+0.5	+0.5	+0.5	+0.6	+0.6
Gain by Beam Tilt, average, dB	17.1	15.0	21.1	21.3	21.1	21.0
Tolerance, dB	+0.4	+0.3	+0.3	+0.3	+0.4	+0.4
Beamwidth, Horizontal, degrees	67	63	66	65	63	55
Beamwidth, Vertical Tolerance, degrees	+0.6	+0.7	+0.4	+0.4	+0.4	+0.2
USLS, beampeak to 20° above beampeak, dB	17	13	15	15	16	16
Front-to-Back Total Power at 180° ± 30°, dB	23	21	28	31	31	30
CPR at Bore-sight, dB	24	23	19	18	20	22
CPR at Sector, dB	6	10	6	6	9	8

* Commscope® supports NGMN recommendations on Base Station Antenna Specifics (BASTA). To learn more about the benefits of BASTA, download the whitepaper: [Time to Reassess the Role of BASTA](#)

Array Layout

FFHH-65CR3

Array	Freq (MHz)	Ports	RET (dB)	AISG RET UID
Y1	617-806	1-2	1	ANXXXXXXXXXXXX01
X1	617-806	3-4	1	ANXXXXXXXXXXXX01
Y2	1695-2360	5-6	2	ANXXXXXXXXXXXX02
X2	1695-2360	7-8	2	ANXXXXXXXXXXXX02

Port Configuration



General Specifications

Operating Frequency Band	1695 - 2360 MHz 617 - 806 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage
Total Input Power, maximum	900 W @ 30 °C

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4

1. OCTO ANTENNA SPECIFICATIONS

SCALE: N.T.S.

FFHH-65CR3

RF Connector Interface	4 3-10 Female
Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	1925.0 N @ 150 km/h 432.0 lbf @ 150 km/h
Wind Loading, lateral	351.0 N @ 150 km/h 78.9 lbf @ 150 km/h
Wind Loading, rear	1945.0 N @ 150 km/h 437.3 lbf @ 150 km/h
Wind Speed, maximum	241 km/h 150 mph

Dimensions

Length	3417.0 mm 95.9 in
Width	640.0 mm 25.2 in
Depth	235.0 mm 9.3 in
Net Weight, without mounting kit	57.9 kg 127.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10-30 Vdc
Internal RET	High Band (7) Low Band (1)
Power Consumption, idle state, maximum	1 W
Power Consumption, normal, maximum	10 W
Protocol	3GPP AISG 2.0 (5-Port RET)
RET Interface	8-pin DIN Female 8-pin DIN Male
RET Interface quantity	1 female 1 male

Packed Dimensions

Length	2590.0 mm 102.0 in
Width	752.0 mm 29.6 in
Depth	380.0 mm 15.0 in
Shipping Weight	84.4 kg 186.1 lb

Regulatory Compliance/Certifications

Agency	RoHS 2011/65/EU China RoHS SJ/T 11364-2006 ISO 9001:2008
Classification	Compliant by Exemption Above Maximum Concentration Value (MCV) Designed, manufactured and/or distributed under this quality management system



T-Mobile

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SIGNATURES:
DATE: 6/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/15/20

CH42545B LA GRANGE PARK WATER TANK

937 BARNSDALE RD
LA GRANGE PARK, IL 60526

ANTENNA INFORMATION

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

C-6

Band	B41 – 2496-2690 MHz
Supported Modulation schemes	(DL) BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM (UL) BPSK, QPSK, 16 QAM, 64 QAM
No. of ports	32TX32RX and 64TX64RX
MIMO Streams	16
Instantaneous IBW	60MHz on Band 41
Total Avg EIRP	74.8 dBm
Supported bandwidths	LTE 1.4,3,5,10,15,20 MHz
Output Power	120W Total (3x40W)
Power Consumption	850 W typical (ETSI average)
Optical Ports	3 x QSFP+ (each 4* Gbps CPRI)
Connector Type	DC -40.5V ... -57V/2 Pole connector
Installation Options	4.3-10+
AISG	AISG on all ports, DC on ANT1 and ANT3
Dimensions (H x W x D)	25.6 x 10.3 x 19.7
Weight lbs	103.6 lb
HW/SW Availability	Sept'19 – SRAN19A
5G NR Support	YES
Material Description	AAHF AirScale2 Dual RRH 4T4R B25/66 480W



AAHF 474715A

2. AAHF – MASSIVE MIMO ANTENNA SPECIFICATIONS

SCALE: N.T.S.

3. SPECIFICATIONS Power Transmission PowerPlus PowerPlus 100-3-1U

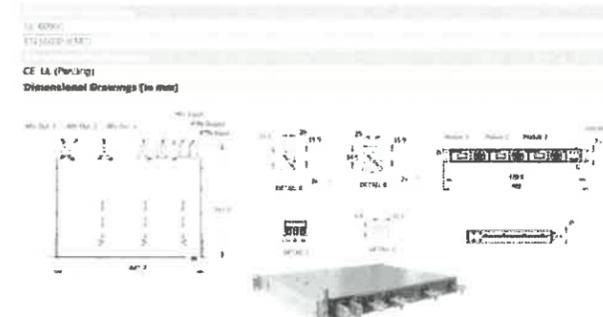
Rack	3 PowerPlus Modules
Module capacity	18.5 kW
Idle power	300 A
Total maximum output current	560 mVpp
Total output voltage ripple (3 modules) @ Po max	-65 to -53 Vdc
Combined output voltage range	60%
Combined efficiency (3 modules)	
Electrical Specification (per module)	
Input voltage range	-60 to -40 Vdc
Max input current	100 A
Efficiency	60%
Output voltage range	-65 to -53 Vdc
Output current max	100A
Rated output power	6.5 kW
Output voltage ripple @ Po max @ nom Vo	540 mVpp

Environmental Specification

Operating temperature	-20 to +70 °C
Storage temperature	-30 to +80 °C

Mechanical Specification

Depth (Rack)	343.5 mm
Net weight (rack)	5.1 kg
Depth (module)	174 mm
Height (module)	41 mm
Width (module)	130.2 mm
Weight (module)	0.975 kg
Cooling	Dynamic Ventilation



3. DETAIL-POWER BOOSTER

SCALE: N.T.S.



HP-Large 3 Power Cabinet

Product Features

Compact design for equipment & power:

- 30RU supports 3 radios and transport equipment
- 600A to 48V power system
- Slimline high efficiency rectifier
- ORION Touch screen Controller
- Rear Access Hatch

Direct air-cooling solution, 6000W capacity, 5°C delta T

Easy slide-in filter replacement

Connects with:

- SB3, 2-string battery cabinet
- LB3, 4-string battery cabinet
- V2, Expansion equipment and battery cabinet

Designed to meet GR-487 specifications

www.deltacorp.com



Large Battery 3 Cabinet

LB3 Site Support Enclosure

Product Features

- Direct air cooling solution with optional Gore filter
- Supports four strings of 48V VRLA batteries up to 210Ah
- 600A bus bar with individual 200A breakers per string
- Bulk Input / Output with ability to daisy chain cabinets
- Connection kit includes cables with disconnects
- Rear hatch access
- Corrosion resistant aluminum construction
- Powder coated high gloss finish
- Designed to meet GR-487

www.deltacorp.com



Specifications

Model	HPL3 (HP-Large 3 Power Cabinet)
1. General	Aluminum enclosure Dimensions (W x H x D) 30 x 72 x 34.6 in (762 x 1829 x 879mm) Depth with Door Hatch: 44.7 in (1126mm) Weight: ~985 lbs (447kg) (without customer equipment or battery) Total Equipment space: 30RU Internal rack dimension: Horizontal rack: 18" x 27RU Vertical rack: 18" x 2RU Power System space: 27" x 12RU
2. Mounting options	Full-mount, pinth options
3. Finish	Polyester Powder Paint (T and U) UL Listed: EIC / EN 60398
4. Environmental	Operating temperature: -40°C to +50°C (-40°F to +122°F) with water load #155 Protection class: assigned to GR-487 Acoustics: 60dBA @1000Hz (with load), 70dBA @ 6000Hz (with load) Humidity (relative): 95%, non-condensing (30 to 90%)
5. Cooling Equipment	Direct Air Cooling, 6000W capacity, 5°C delta T Forced air heating (2) 1000W AC heaters
6. Equipment	Knock-out plate on each upper side with additional knockouts on sides (1) 1" knockout hole with hole plug Door latch: 3 point latching, 5/16 nut driver tool, padlocking capability Primary ground: 50 double-throw 1C-30 required (based on 54" center ground bar) Lifting Ears: 4 Lifting Tabs Plinth: Optional 6" plinth available AC Load Center: 200V split phase, dual feed, (1) 200A + (1) 100A 200V 3-phase, single feed, (1) 100A AC Surge Protection for each breaker feed GFCI Recaps: 120V Temp Probes: (1) 500mA Adams Transducer block 600V 50V (200V) redundant Power System with DIN rail distribution 12 recloser positions (1) 50A DPO300 reclosers included 48 poles for load (2) 1/4 inch, 1000V air circuit breaker included 10 poles for battery (2) SB300 / (2) SB175 Battery connections (3) SB300 Connector connections (1) SB300 Connector connections (1) DC protected circuit breaker with (2) MERV-13 filters, 600W output, Clogged Filter alarm pressure switch Door intrusion alarm (2) 1000W AC powered heaters LED interior cabinet light Rear Hatch: Intruder alert with (3) MERV-13 filters, (2) 100W heaters
7. Interfacing connections	Cabinet: EBO400-HCU01 HP-Large 3 600A Power / Equipment Cabinet Rectifier: ESR-4800A-T 48V / 56A 2000W, 60-45, CAN communication Controller (Ramp): TPB 1020005417 Chan TOUCH Controller Plinth: P 37003188-1600-6 Plinth for V1/V2 HPL3, LBS2 and LBS3

Delta Group Website: www.deltacorp.com

Product Website: www.deltacorp.com/products

United States of America & Canada: Delta Structures U.S. Inc. 2905 E. Platte Parkway, Plano, TX (Texas) 75074

Sales and Support: Delta Structures U.S. Inc. 2905 E. Platte Parkway, Plano, TX (Texas) 75074

Online: Delta Structures U.S. Inc. 2905 E. Platte Parkway, Plano, TX (Texas) 75074

Field Support: 1-877-DELTA-08 option 3 (877-335-6208 option 3)

Installation Services: Delta Structures U.S. Inc. 2905 E. Platte Parkway, Plano, TX (Texas) 75074

PLM: 1-877-DELTA-08 option 3 (877-335-6208 option 3)

Nokia AirScale SM Indoor Technical Datasheet

AirScale SM Indoor general specification

Capacity	Per Capacity plug-in unit in LTE16A; 8 LTE cells (FDD)
Multi-RAT capable platform	
Minimum configuration	1 Common PIU (transport and control), 1 Capacity PIU (baseband processing)
Maximum configuration	2 Common PIU, 6 Capacity PIU
Installation options	19 inch standard rack, pole and wall (with mounting plinth), inside Outdoor Enclosure



Minimum configuration (1x BTS)

AirScale SM Indoor mechanical specifications

Dimensions	1310 H 128 mm x W 447 mm x D 400 mm H 5.04" x W 17.60" x D 15.75"
Installation Depth	400mm + cooling air space 50mm
Weight	Minimum (Common PIU + Capacity PIU): typ 10.1kg 22.27 LBS Maximum (2 Common PIU + 6 Capacity PIU): typ 23.5kg 51.81 LBS
Ingress protection	IP20
Operational Temperature Range	-5°C to 55°C



Minimum configuration (2x BTS, 1 BTS per half subrack)

AirScale SM Indoor electrical specifications

Supply Voltage / Voltage Range	Nominal: -48V DC / -60.5V to -57V
Power consumption	1 Common PIU & 1 Capacity PIU: typ 210W 1 Common PIU & 3 Capacity PIU: typ 420W 2 Common PIU & 6 Capacity PIU: typ 840W



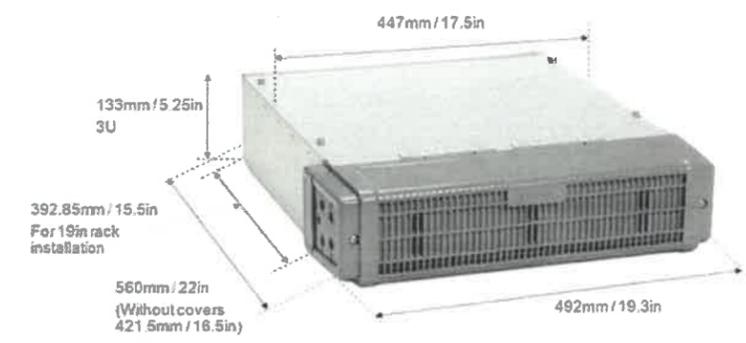
Maximum AirScale SM Indoor configuration (1x BTS per half subrack)

One typical BTS in Full Subrack (future releases) NOKIA

2 DETAIL-AMIA SCALE: N.T.S.

Flexi Multiradio BTS System Module FSMF

- < 15 liters
- < 15 kg
- 3 height units
- IP65
- -35 to +55 °C



NOTE: EXISTING FSMF TO BE CLEANED AND ITS FANS REVERSED BEFORE INSTALLING INSIDE SSC-HPL3.

3 DETAIL-FSMF SCALE: N.T.S.

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CONSULTING ENGINEERS
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LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS
DATE: 6/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/15/20

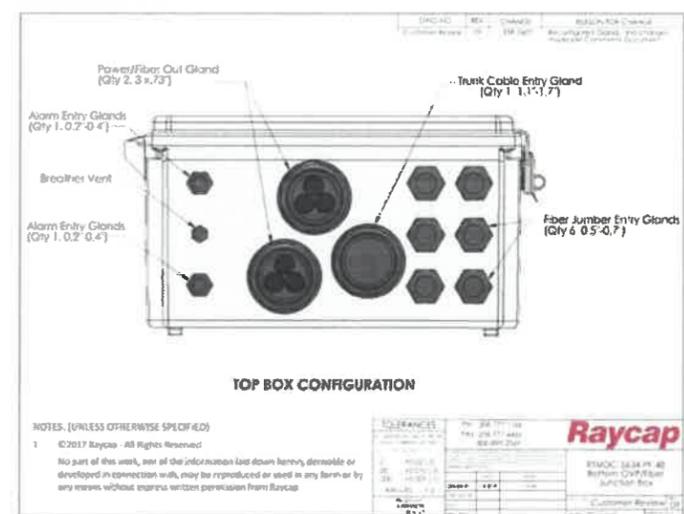
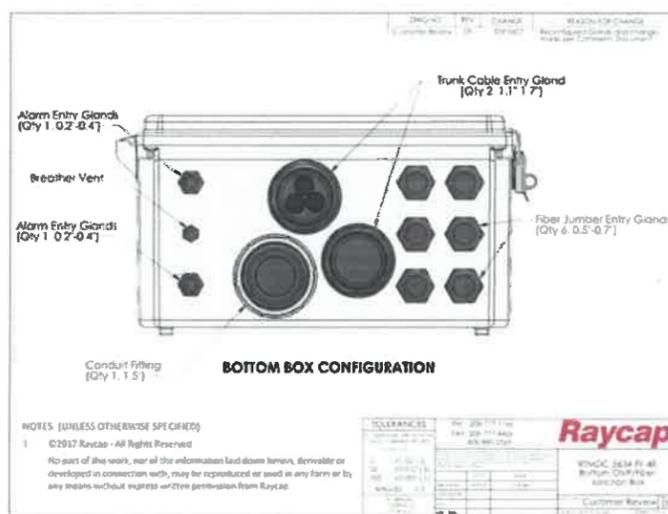
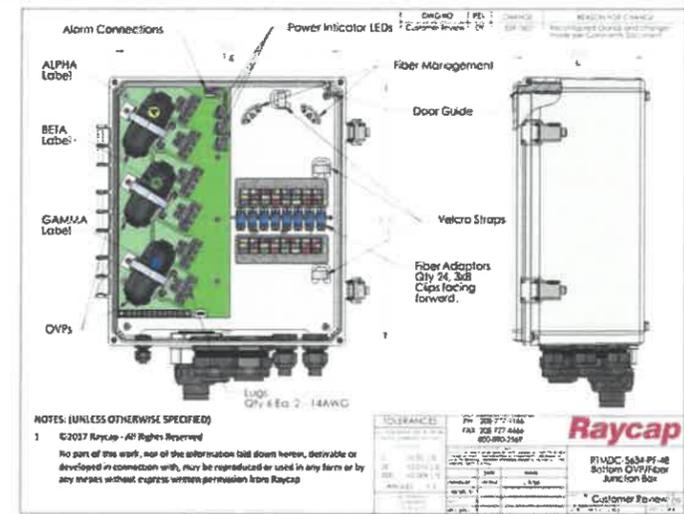
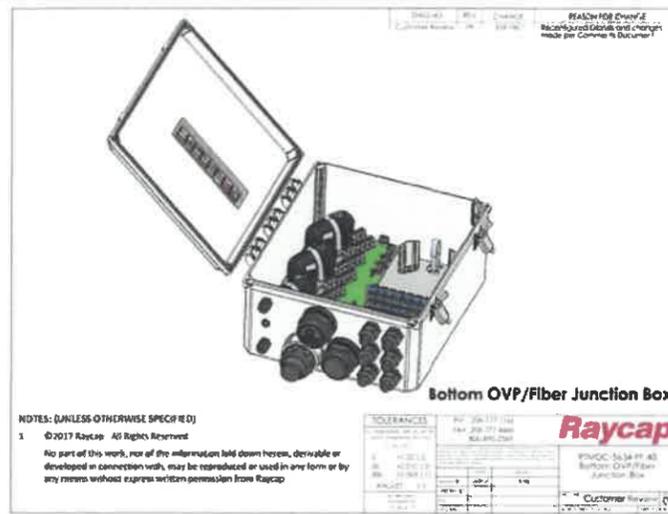
CH42545B
LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

EQUIPMENT INFORMATION

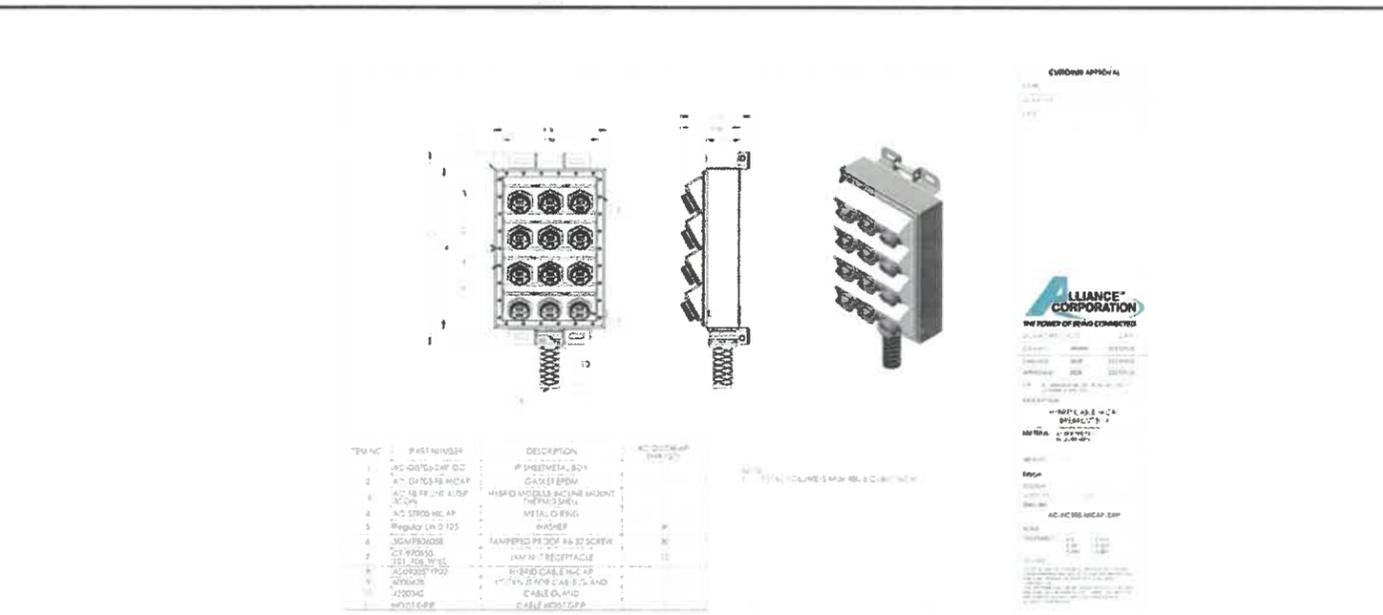
Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:
	Approved by: MS
	Date:

C-7

1 DETAIL-HP LARGE SITE SUPPORT CABINET & BBU SCALE: N.T.S.



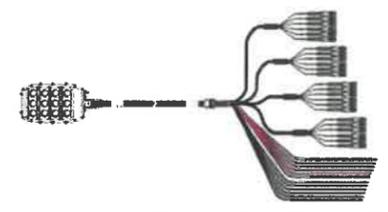
1 DETAIL-BOTTOM OVP
 SCALE: N.T.S.



2 DETAIL-HYBRID CABLE BREAKOUT BOX/TOWER JUNCTION BOX
 SCALE: N.T.S.



HybridConnect®
 NWS-HCS2-HC6-XXX
 HCS 2.0 Trunk HiCap 12 RRU 12x6AWG



Product Specification

General Specifications			
Nominal O.D.	1.480 in (37.60 mm)		
Cable Weight	1610 lb/mft (2396 kg/km)		
Jacket Color	Black		
Minimum Bend Radius: Installed	21.5 in		
Fiber Optic Cable Specifications			
Fiber Pairs	24		
Fiber Type	Singlemode G.657.A2		
Insertion Loss	1.5 db MAX per channel (2 connectors)		
Breakout Length: End 1	31 in (775 mm), 33 in (826 mm), 35 in (889 mm), 39 in (992 mm)		
Breakout Length: End 2	Molded Enclosure		
Termination: End 1	DIC connectors		
Termination: End 2	U Hybrid 25		
DC Cable Specifications			
DC Pairs	6		
DC Conductor Size	6 AWG		
DC Resistance: Maximum	0.42 Ohms / 1000 ft		
Breakout Length: End 1	31 in (775 mm)		
Breakout Length: End 2	Molded Enclosure		
Color Code	Black & Red colored, Number printed		
Environmental Specifications			
Operating Temperature	-40°C to 90°C (dry) / 75°C (wet)		
Installation Temperature	-20°C to 60°C		
Thermal Cycle	-40°C to 80°C		
Ingress Protection	IP67		
Standards and Compliance			
UL B3: Thermoplastic-Insulated Wires and Cables			
UL 1277: Electrical Power and Control Tray Cables with Optional Optical-Fiber Members			
UL TR84/TW84 600V			
UL Type TC 600V			
End Face Visual Inspection Per IEC 61300-3-35			
Product Ordering			
Part Number	Description	T-Mobile SKU	
NWS-HCS2-HC6-25	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 25 FT	TBD	
NWS-HCS2-HC6-50	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 50 FT	TBD	
NWS-HCS2-HC6-75	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 75 FT	TBD	
NWS-HCS2-HC6-100	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 100 FT	TBD	
NWS-HCS2-HC6-125	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 125 FT	TBD	
NWS-HCS2-HC6-150	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 150 FT	TBD	
NWS-HCS2-HC6-175	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 175 FT	TBD	
NWS-HCS2-HC6-200	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 200 FT	TBD	
NWS-HCS2-HC6-225	HCS 2.0 Trunk HiCap 12 RRU 12x6AWG 225 FT	TBD	
Installation Accessories			
Part Number	Description	UOM	T-Mobile SKU
AA-34-SS	Angle Adaptor, 3/4" Thru Hole for Snap-In Hangers, Stainless Steel	10PK	TBD
SO-34-SS	Stand-off Adaptor, 3/4" Thru Hole for Snap-In Hangers, Stainless Steel	10PK	TBD
SO3-34-SS	3-Way Stand-off Adaptor, 3/4" Thru Hole for Snap-In Hangers, Stainless Steel	10PK	TBD
HDW-INSERT-SS	Insert for Adaptors, 3/8" Threaded Hole, Stainless Steel	10PK	TBD
SH-15B	Snap-In Hanger for 1-5/8" Cable	10PK	TBD
CB2-15B	Cable Block for 1-5/8" Cable, Double End	10PK	TBD
CG-1-3B-15B	Cable Grommet for (1) 6AWG Hi Cap HCS 2.0 Trunk, Fits 1-6/8" Hangers	10PK	TBD
GK-UT	Universal Ground Kit w/ 5' Lead, Tinned Copper	EA	TBD
HO1T-3BM-L	Hoisting Grip for 6AWG Hi Cap HCS 2.0 Trunk, Latch-Up	EA	TBD
HO1T-3GM-PI	Hoisting Grip for 6AWG Hi Cap HCS 2.0 Trunk, Pre-Loaded	EA	TBD

3 DETAIL-HCS 2.0 TRUNK CABLE
 SCALE: N.T.S.

T-Mobile®
 1400 OPUS PLACE, SUITE 700
 DOWNERS GROVE, IL 60515
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CH42545B
LA GRANGE PARK WATER TANK
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 LA GRANGE PARK, IL 60526

EQUIPMENT INFORMATION

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

C-8

Product Specifications

COMMSCOPE

HFT410-4SNOK2-150

HELLAX® FiberFeed® Hybrid Cable Assembly, HQLC, End 1: 4 fibers terminated D/C for block BNCs with both cut power cord (end 2: 4 fibers terminated LC and 4 x 10 AWG conductors terminated at hybrid trunk connector, 150 m

Construction Materials

Fiber Type: Bend insensitive uncoated Fiber (LC/150) (A2)
 Fiber Count: 4
 Jacket Type: Polyethylene
 Jacket Color: Black

Dimensions

Cable Length: 45.71 m (150.00 ft)
 Breakout Length, Fiber, end 1: 0.15 m (0.50 ft)
 Breakout Length, Fiber, end 2: 0.15 m (0.50 ft)
 Breakout Length, Cable, end 2: 0.05 m (0.20 ft)

Environmental Specifications

Environmental Scope: Military Installation
 Operating Temperature: -40°C to +70°C (-40°F to +158°F)

General Specifications

Conductor Gauge: #1
 Conductor Type: Hybrid Standard End
 Connector: LC/150 (A2)
 Interface: BNC Male Connector, 4 Pin, angle
 Jacket: Polyethylene, 1.5 mm (0.06 in.)
 Jacket Color: Black
 Jacket Type: Polyethylene
 Jacket Color: Black
 Jacket Type: Polyethylene
 Jacket Color: Black

Regulatory Compliance/Certifications

Agency: RFLS 2011/65/1U
 Classification: Compliant
 ESD: 1000-2008
 Designed, manufactured and/or distributed under the quality management system



Included Products

760234195 | HFC-4SM-410-APVA (Product Component - not available) - HELLAX® FiberFeed® Hybrid Cable, UL Type TC-DF-18
 CS-8G-MP (Product Component - not available) - Enhanced Low MacroBending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2, B3)

760234195 | HFC-4SM-410-APVA
 HELLAX® FiberFeed® Hybrid Cable, UL Type TC-DF-18

Representative Image



General Specifications

Conductor Gauge: 18 AWG
 Conductor Type: Shielded
 Application: Hybrid LC/150
 Board: HELLAX® FiberFeed®
 Cable Type: Hybrid
 Jacket Type: Polyethylene
 Jacket Color: Black
 Jacket Type: Polyethylene
 Jacket Color: Black
 Jacket Type: Polyethylene
 Jacket Color: Black

Construction Materials

Fiber Type: Bend insensitive uncoated Fiber (LC/150) (A2)
 Fiber Count: 4
 Jacket Type: Polyethylene
 Jacket Color: Black
 Jacket Type: Polyethylene
 Jacket Color: Black

Electrical Specifications

Resistance, Maximum: 1.000 ohm/m
 Resistance, Minimum: 0.900 ohm/m
 Maximum value based on a standard deviation of 20% (AAT)

Dimensions

Cable Length: 150.00 m
 Cable Weight: 206.5 kg
 Diameter (Outer Jacket): 12.7 mm
 Diameter (Inner Jacket): 12.7 mm

Physical Specifications

Minimum Bend Radius, Multiple Bands, unshielded: 200 mm (7.87 in.)
 Minimum Bend Radius, Multiple Bands, unshielded: 220 mm (8.66 in.)
 Minimum Bend Radius, Single Band, unshielded: 120 mm (4.72 in.)
 Tensile Load, Long Term, Maximum: 800 N (180 lbf)
 Tensile Load, Short Term, Maximum: 2400 N (540 lbf)

Environmental Specifications

Environmental Scope: Military Installation
 Installation Temperature: -40°C to +70°C (-40°F to +158°F)
 Operating Temperature: -40°C to +70°C (-40°F to +158°F)
 Storage Temperature: -40°C to +70°C (-40°F to +158°F)

Mechanical Test Specifications

Compression: 20 N/mm (1.34 lbf/in)
 Compression Test Method: IEC 60341
 Flex: 20 N/mm (1.34 lbf/in)
 Flex Test Method: IEC 60341
 Impact: 2.00 J/m (1.47 ft-lb/in)
 Impact Test Method: IEC 60341
 Tensile Test Method: IEC 60341

Qualification Specifications

Qualification Test Method: IEC 60341
 Test Method: IEC 60341

Regulatory Compliance/Certifications

Agency: RFLS 2011/65/1U
 Classification: Compliant
 ESD: 1000-2008
 Designed, manufactured and/or distributed under the quality management system



Included Products

CS-8G-MP (Product Component - not available) - Enhanced Low MacroBending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2, B3)

Footnotes

Operating Temperature: See product applicable to the intended application

CS-8G-MP

Enhanced Low MacroBending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2, B3)

Optical Specifications, Wavelength Specific

Minimum Attenuation: 0.15 dB/km @ 1550 nm
 Maximum Attenuation: 0.20 dB/km @ 1550 nm
 Dispersion: 17 ps/nm.km @ 1550 nm
 Polarization Mode Dispersion: 0.05 ps/nm.km
 Birefringence: 0.0001
 Mode Field Diameter: 10.4 µm @ 1550 nm
 Mode Field Diameter: 10.4 µm @ 1550 nm
 Mode Field Diameter: 10.4 µm @ 1550 nm
 Mode Field Diameter: 10.4 µm @ 1550 nm

Physical Specifications

Cable Diameter: 12.7 mm
 Cable Diameter: 12.7 mm

Optical Specifications, General

Optical Loss: 0.15 dB/km
 Dispersion: 17 ps/nm.km
 Polarization Mode Dispersion: 0.05 ps/nm.km
 Birefringence: 0.0001

Mechanical Specifications

Cable Length: 150.00 m
 Cable Weight: 206.5 kg
 Diameter (Outer Jacket): 12.7 mm
 Diameter (Inner Jacket): 12.7 mm

Environmental Specifications

Operating Temperature: -40°C to +70°C
 Storage Temperature: -40°C to +70°C
 Humidity: 5% to 95%
 Shock: 1000 g

DETAIL-HYBRID JUMPER CABLE
 SCALE: N.T.S.

AirScale Dual RRH 4T4R B12/71 240W AHLOA (Draft)



Product Code: 474331A	
Supported Frequency bands	3GPP Band 12/71
Frequencies	Band 12 adjusted: Rx 698 - 715 MHz, TX 728 - 745 MHz Band 71: Rx 663 MHz - 698 MHz, TX 617 MHz - 652 MHz
Number of TX/RX paths/pipes	4 pipes, 2T2R, 2T4R, 4T4R for both bands
Instantaneous Bandwidth IBW	16 MHz for B12 and 35MHz for B71 1 MHz below B12 NB IoT future use
Occupied Bandwidth OBW	52 MHz total across bands
Output Power	60W per TX shared between bands
Supply Voltage / Range	DC -48 V / -36 V to -60 V
Typical Power Consumption	664W [ETSI Busy Hour Load at 4TX@60W (Both Bands Active)] 395W [ETSI Busy Hour Load at 4TX@30W (One Band Active)]
Antenna Ports	4 ports, 4 3-10+
Optical Ports	2 x CPRI 9.8 Gbps
ALD Control Interfaces	AISG3.0 from ANT1, 2, 3, 4 and RET (DC on ANT1 & ANT3)
Other Interfaces	External Alarm MDR - 26 Serial connector (4 inputs, 1 Output) DC Circular Power Connector
Physical	560 mm x 308 mm x 189 mm (22.05" x 12.13" x 7.44") Approximately 38kg with no covers or brackets (83.78 lbs)
Operating Temperature Range	-40°C to 55°C (with no solar load)
Surge Protection	Class II 5A
Installation Options	Vertical & Horizontal Rack Mount, Pole & Wall Mount

DETAIL-AHLOA
 SCALE: N.T.S.

LTE5213/SR002411: Nokia Airscale Dual RRH 4T4R B25/B66 Module AHFIG



Description

LTE5213/SR002411: Nokia AirScale Dual RRH 4T4R B25/66 480 W AHFIG feature in release LTE19A/SRAN19A introduces the new Nokia AirScale Multiband Remote Radio Head with four transmitters and four receivers for 3GPP Band 25 and Band 66 enabling it to support one sector and two bands simultaneously with up to 4x40 W for B66 and 4x80 W for B25 at the antenna connector.

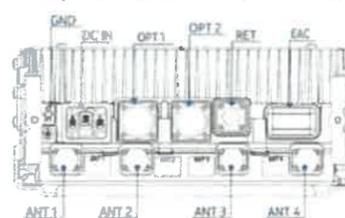
AHFIG is an updated version of the AHFIB with an improvement in the output PA power for B25 to 4x80 W as compared to 4x40 W in AHFIB. Output PA power for B66 is same as AHFIB (4x40 W).

This radio can be used in LTE only or LTE/WCDMA/GSM using the SRAN functionality. Classical RF sharing with WCDMA or GSM is not supported with this radio. The AHFIG radio will work only with AirScale system module. The AHFIG is a 5G capable radio.

The AHFIG is a 4TX/4RX RRH for Band 25 and Band 66. There are four ports on the RRH. It is a one sector radio optimized for macro BTS installations.

AHFIG interfaces

The ports of the AHFIG are shown below



Dimensions and Weight

Property	Value
Height	Core RRH: 695 mm (27.4 in.) With upper and lower mounting brackets: 730 mm (28.7 in.)
Width	Core RRH: 308 mm (12.1 in.) With mounting cover: 327 mm (12.9 in.)
Depth	Core RRH: 131 mm (5.2 in.) With mounting cover: 142 mm (5.6 in.)
Weight	Core RRH: 32 kg (70.5 lb)

DETAIL-AHFIG
 SCALE: N.T.S.



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LICENSED PROFESSIONAL ENGINEER
 SEEMESH M. SETHI
 0062-051290
 STATE OF ILLINOIS
 SIGNATURES: [Signature]
 DATE: 6/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/15/20

CH42545B
 LA GRANGE PARK WATER TANK
 937 BARNSDALE RD
 LA GRANGE PARK, IL 60526

EQUIPMENT INFORMATION

Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:
	Approved by: MS
	Date:

C-9

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SIGNATURES:
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REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
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CH42545B
LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
RF DATA CONFIGURATION SHEET

Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:

C-10A

Section 4 - Siteplan Images

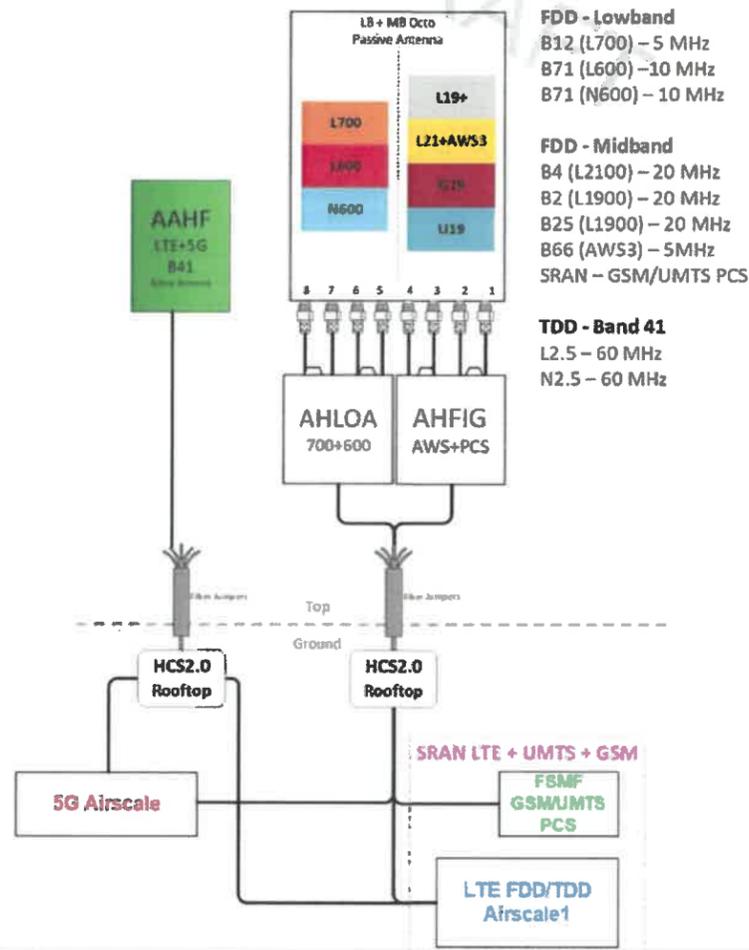
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Section 3 - Proposed Template Images

Configuration 56792X_SR

* For 5G and LTE Airscale BB dimensioning refer to Fiber Port matrices.

(Alpha, Beta & Gamma)



Notes:

Section 5 - RAN Equipment

Enclosure	Existing RAN Equipment		Proposed RAN Equipment			
	1	2	1	2	3	4
Enclosure Type	Generic Cabinet (Nokia)	Generic Site Support Cabinet (Nokia)	Generic 600A Site Support Cabinet	Tower Top Mount (Nokia)	Antenna Equipment (Nokia)	Generic Battery Cabinet for 800A SSC
Baseband	ESMB (G1900), F5MF (L700, L1900, L2100), F5MF (G1900)		ASIA (L700, L1900, L2100), ASK (N2500, N660, L2500), ASB (L600, L700, U1900, G1900), F5MF (U1900, G1900)			
Baseband Submodule	F5BA (U1900), F5BC (L2100)		ASBA (x 2) (L1900), ASBA (x 3) (L2500), ASB (x 3) (N660)			
Power Subsystem		Batteries "Select size", Breakers "Select size", Rectifier Shelf "Select size"				
Radio	F190 (L1400), F250 (G1900), F250 (U1900, L1900), F250 (L700)					
Throttle System		CSR 7900 SAR A				
Allyard Cable System			Voltage Booster PowerPlus v1 2 Amplifier Playcap Extra Amplifier for PowerPlus Voltage Booster			
Antenna Box						Nokia HCS 2.0 Tower Junction Box (x 2)
Power Subsystem		Rectifier Shelf "Select size", Breakers "Select size"				Batteries "Select size"
Radio			AHLOA (x 3) (L700, L600, N600), AHFIG (x 3) (U700, L2100, L1900, G1900)			
Throttle System		CSR 1XRz				

05/18/2020 Added 1 ASIA as per new L1900 BW upgrade

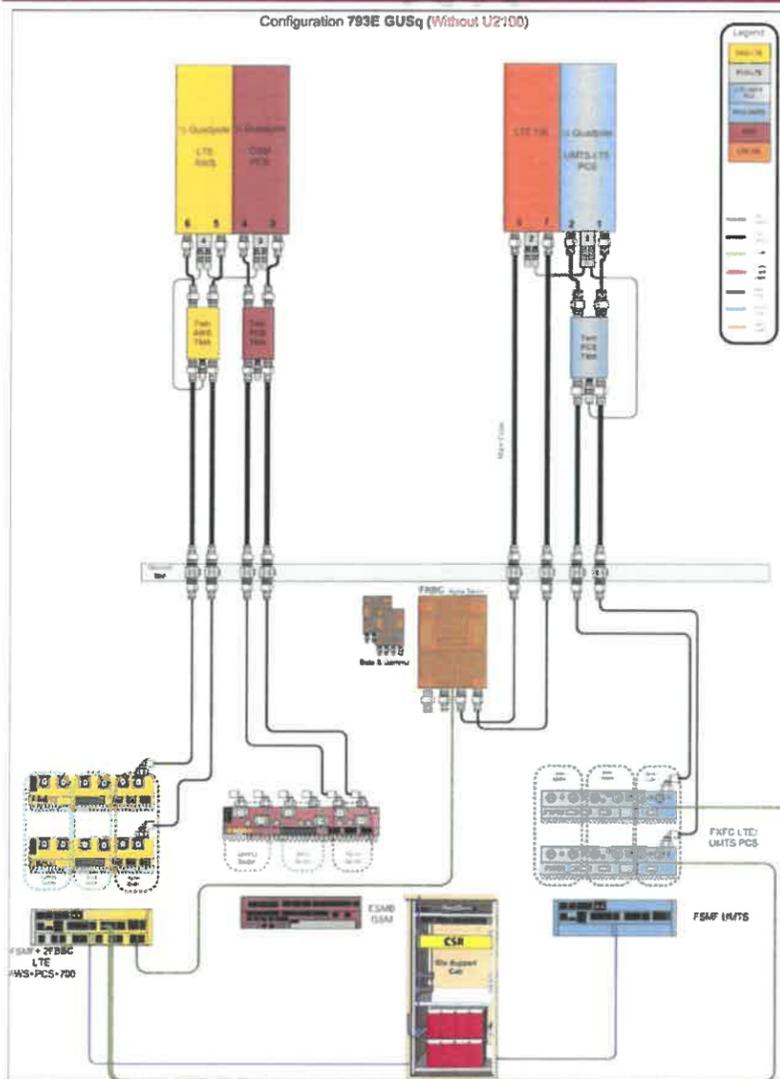
Section 1 - Site Information

Site ID: CH42545B
Site Name: La Grange Park Water Tank
Site Class: Water Tank
Site Type: Structure Non Building
Plan Year: CHICAGO IL
Standard: Nokia
Location: Village La Grange Park

Latitude: 41.83186201
Longitude: -87.86563420
Address: 937 Barnsdale
City, State: LA GRANGE IL
Region: CENTRAL

RAN Template: 56792X_SR
Sector Count: 3
Antenna Count: 6
Case Unit Count: 0
TMA Count: 0
RRU Count: 6

Section 2 - Existing Template Images



Notes:

Section 6 - A&L Equipment

Existing Template: 783E GUS_ No L2100
Proposed Template: 86792X_SR

Sector 1 (Existing) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - SBNH-1D65C (Quad)		CellMax - CMA-8DHP46521/E0-6-RET/7B05 (Quad)	
Antenna Azimuth	0		0	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	U1900, L1900	L700	G1900	L2100
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt	0	0	0	0
Cables	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)
TMA's	CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)		CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)	CommScope Twin Style 1B - ETW200V512UB (E15508P80) (AAntenna)
Diplomers / Combiners				
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Sector 2 (Existing) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - SBNH-1D65C (Quad)		CellMax - CMA-8DHP46521/E0-6-RET/7B05 (Quad)	
Antenna Azimuth	120		120	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	U1900, L1900	L700	G1900	L2100
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt	0	0	0	0
Cables	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)
TMA's	CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)		CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)	CommScope Twin Style 1B - ETW200V512UB (E15508P80) (AAntenna)
Diplomers / Combiners				
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Sector 3 (Existing) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - SBNH-1D65C (Quad)		CellMax - CMA-8DHP46521/E0-6-RET/7B05 (Quad)	
Antenna Azimuth	240		240	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	U1900, L1900	L700	G1900	L2100
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt	0	0	0	0
Cables	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)	Generic Feeder Coax (x2)
TMA's	CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)		CommScope Twin Style 1A - ETW190V512UB (E15508P94) (AAntenna)	CommScope Twin Style 1B - ETW200V512UB (E15508P80) (AAntenna)
Diplomers / Combiners				
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Sector 1 (Proposed) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - FF191-55C-R3 (Dico)		AAHF (Active Antenna - Massive MIMO)	
Antenna Azimuth	0		0	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	L700, L600, N800	L700, L600, N800	U1900, L2100, L1900, G1900	U1900, L2100, L1900, G1900
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt				
Cables				
TMA's				
Diplomers / Combiners				SFC4 (ACabinet) (x2)
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Sector 2 (Proposed) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - FF191-55C-R3 (Dico)		AAHF (Active Antenna - Massive MIMO)	
Antenna Azimuth	120		120	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	L700, L600, N800	L700, L600, N800	U1900, L2100, L1900, G1900	U1900, L2100, L1900, G1900
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt				
Cables				
TMA's				
Diplomers / Combiners				SFC4 (ACabinet) (x2)
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Sector 3 (Proposed) view from front (Note: the images show view from behind)				
Coverage Type	1		2	
Antenna	1		2	
Antenna Model	CommScope - FF191-55C-R3 (Dico)		AAHF (Active Antenna - Massive MIMO)	
Antenna Azimuth	240		240	
Antenna E-Tilt	0		0	
Antenna Height	100		100	
Parts	P1	P2	P3	P4
Active Tech	L700, L600, N800	L700, L600, N800	U1900, L2100, L1900, G1900	U1900, L2100, L1900, G1900
Dark Tech				
Restricted Tech				
Decommission Tech				
E-Tilt				
Cables				
TMA's				
Diplomers / Combiners				SFC4 (ACabinet) (x2)
Radio				
Sector Equipment				
Unconnected Equipment				
Scope of Work				

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

----- This section is intentionally blank. -----

Proposed Power Systems Equipment

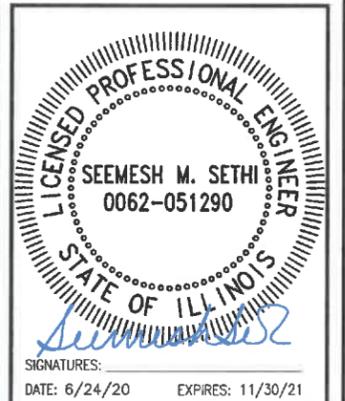


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REV.	DESCRIPTION	DATE
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A	ISSUED FOR REVIEW	6/15/20

CH42545B
LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
RF DATA CONFIGURATION SHEET

Project Number:	Drawn by: AS
Client Project Number:	Checked by: PA
Scale:	Approved by: MS
Drawing Number:	Date:

C-10B

ELECTRICAL NOTES:

THE GENERAL NOTES AND ACCOMPANYING DRAWINGS ARE TO INDICATE THE PROVISIONS AND REQUIREMENTS IN BY THE ELECTRICAL CONTRACTOR OF ALL LABOR, MATERIALS, AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL WORK COMPLETE IN CONNECTION WITH THIS SITE AND SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING:

1. THE INSTALLATION, PROVISION, AND CONNECTION OF A GROUND ROD (ELECTRODE) SYSTEM AS INDICATED IN THE DRAWINGS.
2. THE INSTALLATION AND PROVISION OF AN ELECTRICAL SERVICE (OVERHEAD OR UNDERGROUND) AND ALL CONDUIT AND WIRE ASSOCIATED WITH IT AS INDICATED AND/OR REQUIRED ON PLANS.
3. THE INSTALLATION, PROVISION OF CONDUIT AND CONNECTIONS FOR LOCAL TELEPHONE SERVICE.
4. CONDUITS SHALL BE PVC SCHED. 40 UNLESS OTHERWISE NOTED.
5. ALL FISH LINE SHALL BE LEFT IN CONDUITS (PVC) FOR FUTURE USE.
6. THE CONTRACTOR SHALL FURNISH AND INSTALL ELECTRICAL SERVICE ENTRANCE CONDUCTORS, CONDUIT AND METER SOCKET AND MAKE THE NECESSARY CONNECTION TO THE SERVICE EQUIPMENT WITHIN THE BUILDING.

PRIOR TO THE SUBMISSION OF BIDS, THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL DETAILS AND SCHEDULES ON THE DRAWINGS AND SPECIFICATIONS PROVIDED BY THE OWNER. FOR MEANING OF ABBREVIATIONS AND ADDITIONAL REQUIREMENTS AND INFORMATION, CHECK STRUCTURAL AND OTHER MECHANICAL AND ELECTRICAL DRAWINGS FOR SCALE, SPACE LIMITATIONS, BEAMS, DOOR SWINGS, WINDOWS, COORDINATION, AND ADDITIONAL INFORMATION, ETC. REPORT ANY DISCREPANCIES, CONFLICTS, ETC. TO THE OWNER BEFORE SUBMITTING BID.

UNLESS OTHERWISE NOTED, THE ELECTRICAL CONTRACTOR SHALL PROVIDE THE NECESSARY MOTOR STARTERS, DISCONNECTS, CONTROLS, ETC. FOR ALL EQUIPMENT FURNISHED BY OTHER (FBO). ALL ASSOCIATED EQUIPMENT SHALL BE INSTALLED AND COMPLETELY WIRED BY THE ELECTRICAL CONTRACTOR IN ACCORDANCE WITH MANUFACTURER'S WIRE DIAGRAMS AND AS REQUIRED FOR A COMPLETE OPERATING INSTALLATION. ELECTRICAL CONTRACTOR SHALL VERIFY AND COORDINATE CHARACTERISTICS AND REQUIREMENTS OF (FBO) EQUIPMENT PRIOR TO ROUGH-IN OF CONDUIT AND WIRINGS TO AVOID CONFLICT.

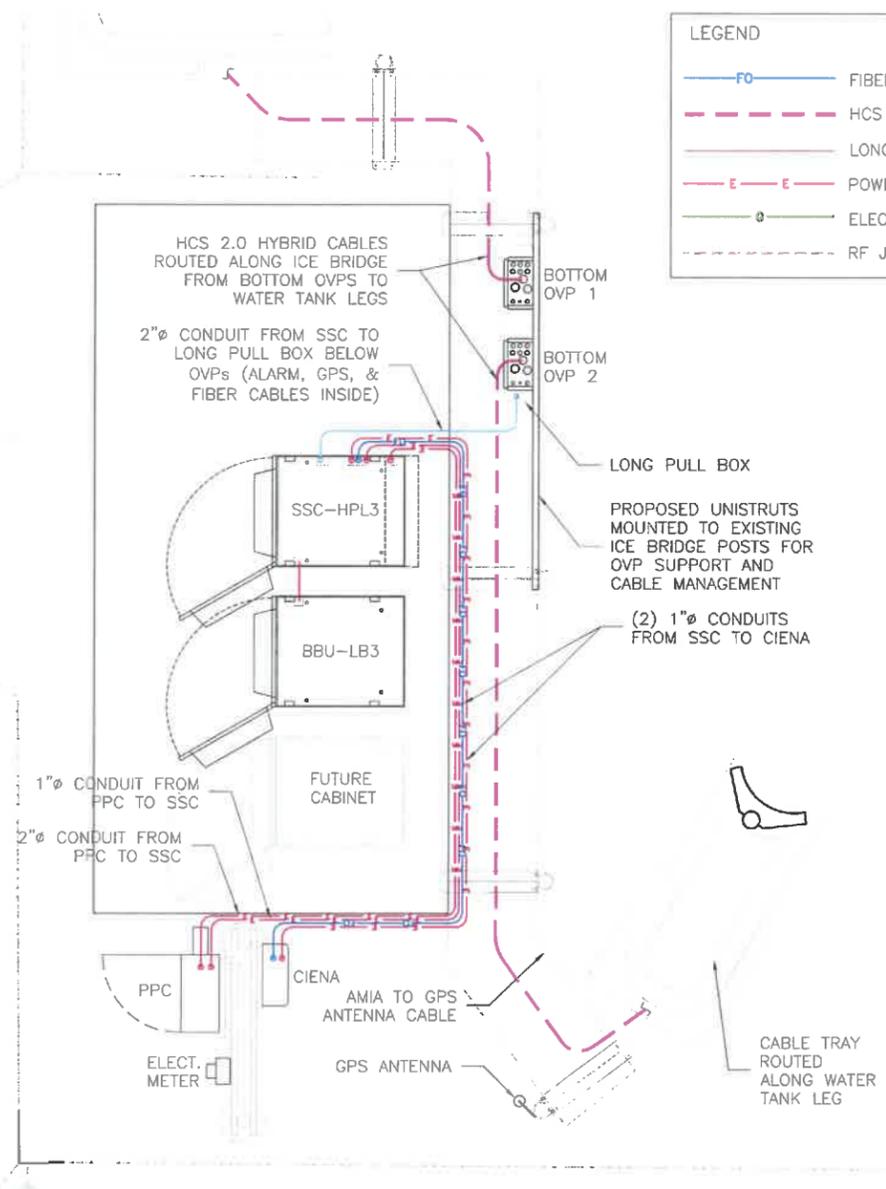
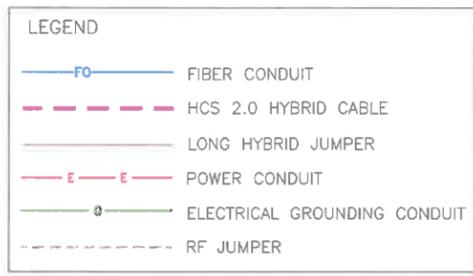
CONTRACTOR RESPONSIBILITIES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND SECURING ALL REQUIRED PERMITS, LICENSES, INSPECTIONS, APPROVALS, AND PAYMENT OF ALL FEES.
2. THE INSTALLATION SHALL BE IN ACCORDANCE WITH ALL APPLICABLE: STATE, LOCAL, AND NATIONAL CODES AS WELL AS THE LATEST ISSUE OF THE VARIOUS APPLICABLE STANDARD SPECIFICATIONS OF THE FOLLOWING RECOGNIZED AUTHORITIES:
 NEC - NATIONAL ELECTRIC CODE
 ANSI - AMERICAN NATIONAL STANDARD INSTITUTE
 IEEE - INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
 ASTM - AMERICAN SOCIETY FOR TESTING MATERIALS
 NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
 UL - UNDERWRITERS LABORATORY, INC.
3. PRIOR TO COMMENCING WORK, THE ELECTRICAL CONTRACTOR SHALL CONFORM TO THE LOCAL UTILITY COMPANY'S

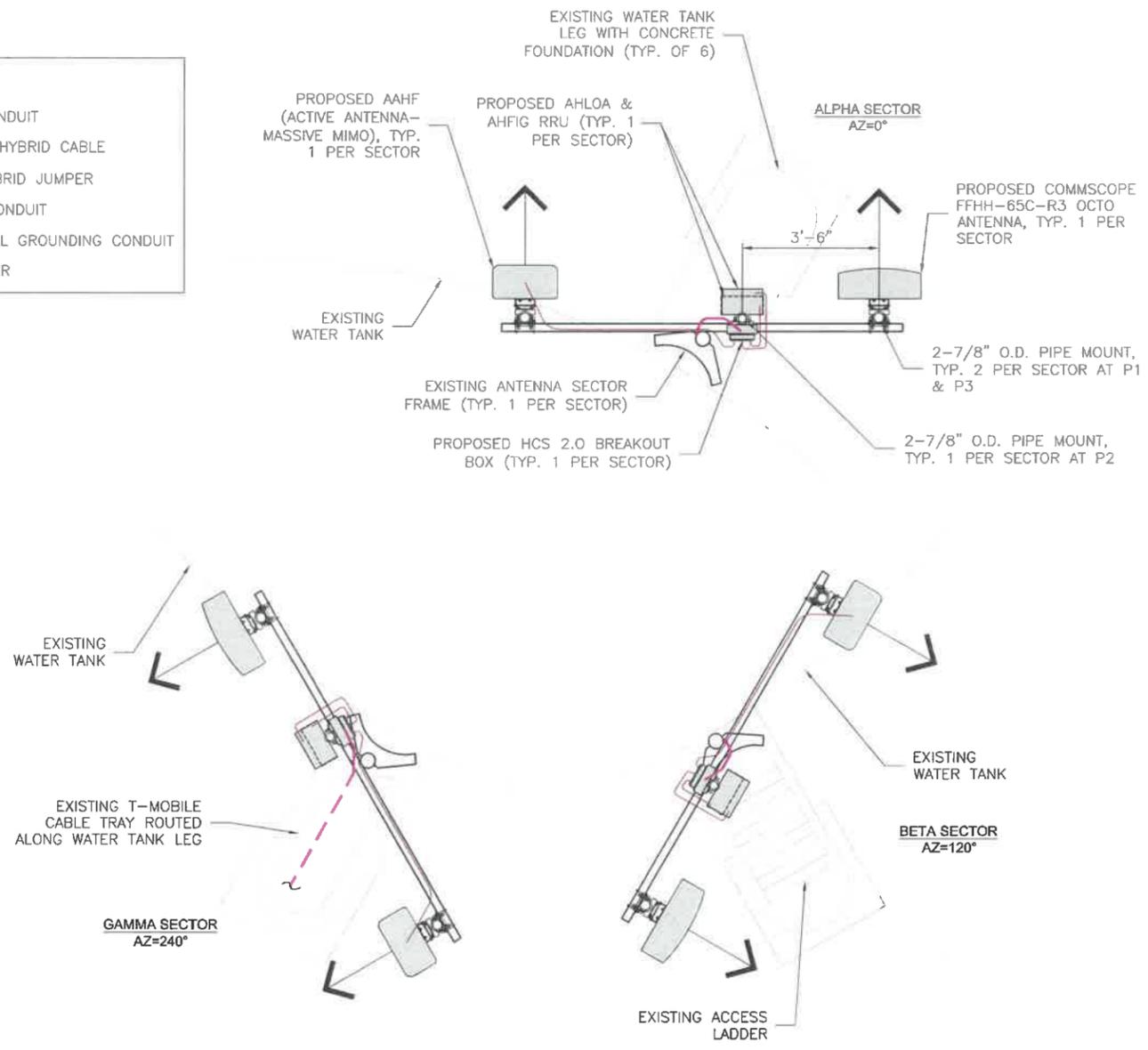
REGULATIONS AND SHALL GET THE APPROVAL FROM THE SAME, BEFORE SUBMITTING HIS BID, TO DETERMINE FROM EACH UTILITY ADDITIONAL COSTS THEY MAY REQUIRE, AND SHALL BE INCLUDED IN HIS BID FOR CONTRACT.

UTILITIES GENERAL NOTES

1. UTILITY POINTS OF SERVICE AND WORK/MATERIALS SHOWN ARE BASED ON PRELIMINARY INFORMATION ONLY, PROVIDED BY THE UTILITY COMPANIES AND ARE FOR BID PURPOSES ONLY.
2. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANY FOR FINAL AND EXACT WORK/MATERIALS REQUIREMENTS AND CONSTRUCT TO UTILITY COMPANY PLANS AND SPECIFICATIONS ONLY. CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUIT, PULL WIRES, CABLES, PULL BOXES, CONCRETE ENCASUREMENT OF CONDUIT (IF REQUIRED), TRANSFORMER PAD, BARRIERS, POLE RISERS, TRENCHING, BACKFILL.
3. PAY ALL UTILITY COMPANY FEES AND INCLUDE ALL REQUIREMENTS IN SCOPE OF WORK.



1 LEASE AREA UTILITY PLAN
E-1 SCALE: 1/4" = 1'-0"



2 CABLE ROUTING AT ANTENNA SECTORS
E-1 SCALE: 1/4" = 1'-0"

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 0062-051290
 STATE OF ILLINOIS
 SIGNATURES:
 DATE: 6/24/20 EXPIRES: 11/30/21

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CH42545B
LA GRANGE PARK WATER TANK
 937 BARNSDALE RD
 LA GRANGE PARK, IL 60526

UTILITY PLAN & ELECTRICAL NOTES

Project Number:	Drawn by: AS
Client Project Number:	Date:
Scale:	Checked by: PA
Drawing Number:	Date:
	Approved by: MS
	Date:
E-1	

GROUNDING NOTES:

- GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("CADWELD") TO ANTENNA MASTS, FENCE POSTS, MONOPOLE, AND THE GROUND RODS, REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS.
- GROUND CABLE SHIELDS AT BOTH ENDS WITH CABLE GROUNDING KITS.
- ROUTE GROUNDING CONDUCTORS ALONG THE SHORTEST AND STRAIGHTEST PATH POSSIBLE, EXCEPT AS OTHERWISE INDICATED. GROUNDING LEADS SHOULD NEVER BE BENT AT RIGHT ANGLE, ALWAYS MAKE AT LEAST 12" RADIUS BENDS. #6 WIRE CAN BE BENT AT 6" RADIUS WHEN NECESSARY.
- CONTRACTOR TO PROVIDE GROUND WIRES, BARS AND CONNECTIONS AS SHOWN ON GROUNDING RISER DIAGRAM. CONTRACTOR SHALL TEST AND VERIFY THAT THE IMPEDANCE DOES NOT EXCEED 5 OHMS TO GROUND BY MEANS OF A 4 POINT BIDDLE-MEGGER TESTER. GROUNDING AND OTHER OPERATIONAL TESTING SHALL BE WITNESSED BY THE OWNER'S REPRESENTATIVE.
- GROUNDING CONDUCTORS SHALL BE COPPER ONLY. ABOVE GROUND EITHER SOLID OR STRANDED CONDUCTORS (W/ THE

EXCEPTION FOR GROUND WIRE BETWEEN THE TOP AND THE BOTTOM OF THE ANTENNA TOWER) MUST BE BARE. EQUIPMENT GROUND LEADS IN CABLE TRAYS MUST BE GREEN INSULATED. BELOW GROUND BARE SOLID TINNED WIRE SHALL BE USED. ALL WIRES MUST BE #2 AWG MIN. WITH THE EXCEPTION OF GROUND WIRES FOR MISCELLANEOUS METALLIC OBJECTS IN THE EQUIPMENT SHELTER, WHERE #6 WIRES CAN BE USED.

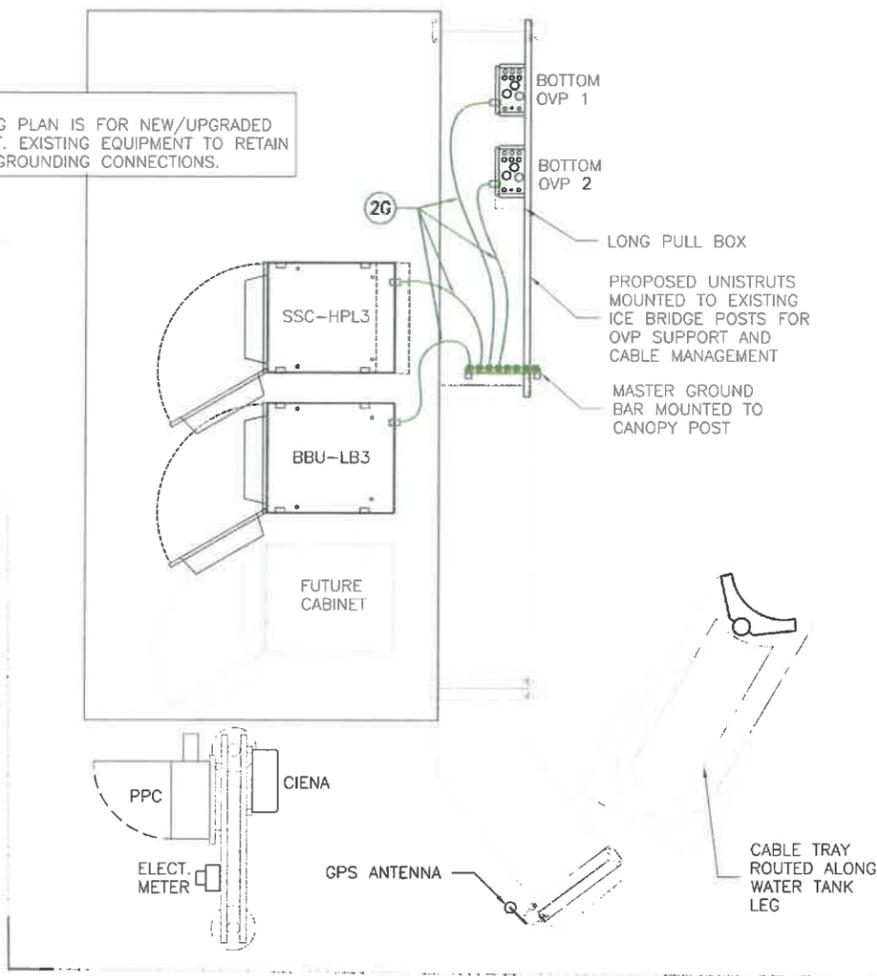
- THE GROUND ELECTRODE SYSTEM SHALL CONSIST OF DRIVEN GROUND RODS UNIFORMLY SPACED AROUND CELL SITE. THE GROUND RODS SHALL BE 3/8"x10'-0" COPPER CLAD STEEL. THE RODS SHALL BE INTERCONNECTED WITH #2 AWG BARE SOLID TINNED COPPER GROUND WIRE BURIED 42" BELOW THE SURFACE OF THE SOIL. MINIMUM DISTANCE BETWEEN GROUND RODS - 8', MAXIMUM - 16'.
- METALS WITHIN 6' OF THE GROUND RING SHALL BE BONDED TO THE GROUND RING.
- THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER WHEN THE GROUNDING IS COMPLETE. THE CONSTRUCTION MANAGER SHALL INSPECT THE GROUNDING SYSTEM PRIOR TO BACKFILLING.

- VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO ANY DIGGING.
- GROUND CONDUCTOR BENDS SHALL NOT BE LESS THAN 8" RADIUS.
- GROUND CONDUCTORS TO THE GROUND RING SHALL BE IN "LIQUID-TITE" FLEX DUCT AND SEALED AT EXIT W/ SILICONE CAULK.
- ANTENNA INSTALLATION CONTRACTOR TO PROVIDE & INSTALL TOP, RF BUSBARS & BUSBAR BELOW CENTERLINE.

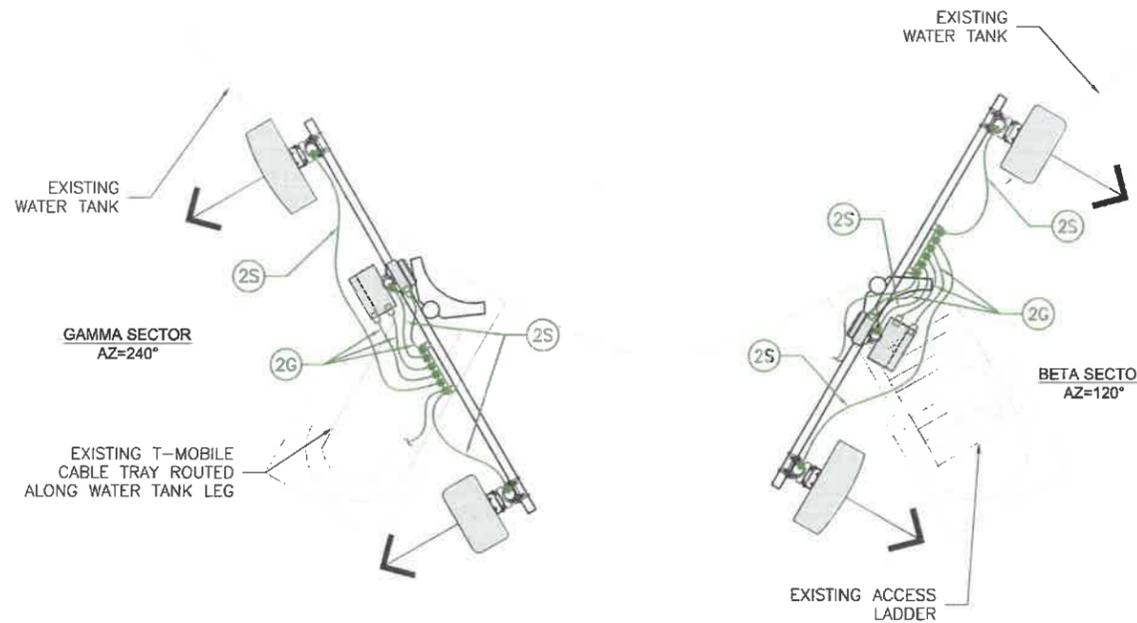
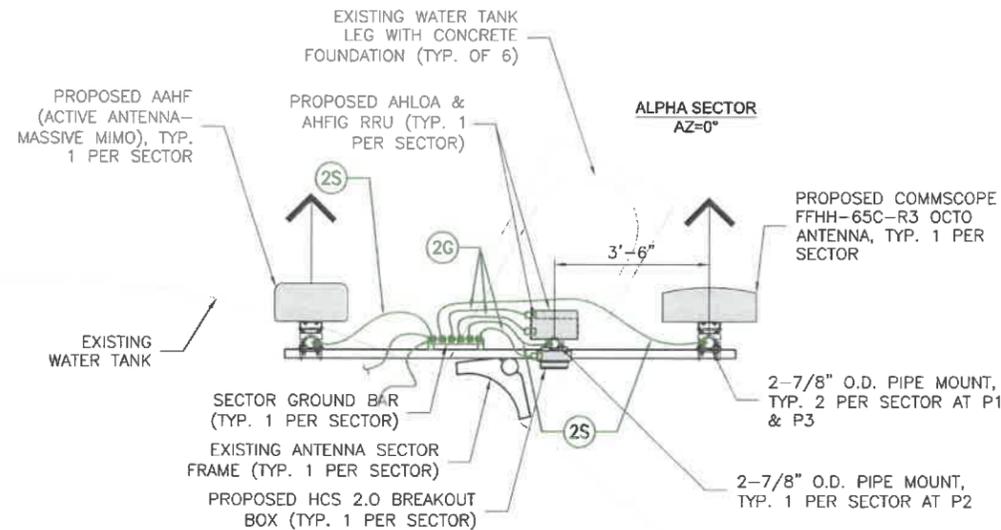
KEY NOTES	
(2G)	#2 AWG GREEN STRANDED GROUND COPPER WIRE
(2S)	#2 AWG SOLID, TINNED BARE COPPER GROUND WIRE
(6G)	#6 AWG GREEN STRANDED GROUND COPPER WIRE

LEGEND	
	GROUND BAR
	CADWELD OR APPROVED CONNECTION
	SPARE GROUND LEAD
	MECHANICAL CONNECTION

NOTE: GROUNDING PLAN IS FOR NEW/UPGRADED EQUIPMENT. EXISTING EQUIPMENT TO RETAIN ORIGINAL GROUNDING CONNECTIONS.



1 LEASE AREA UTILITY PLAN
E-1 SCALE: 1/4" = 1'-0"



2 GROUNDING PLAN AT AT ANTENNA SECTORS
E-1 SCALE: 1/4" = 1'-0"

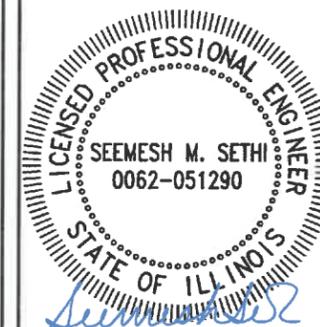


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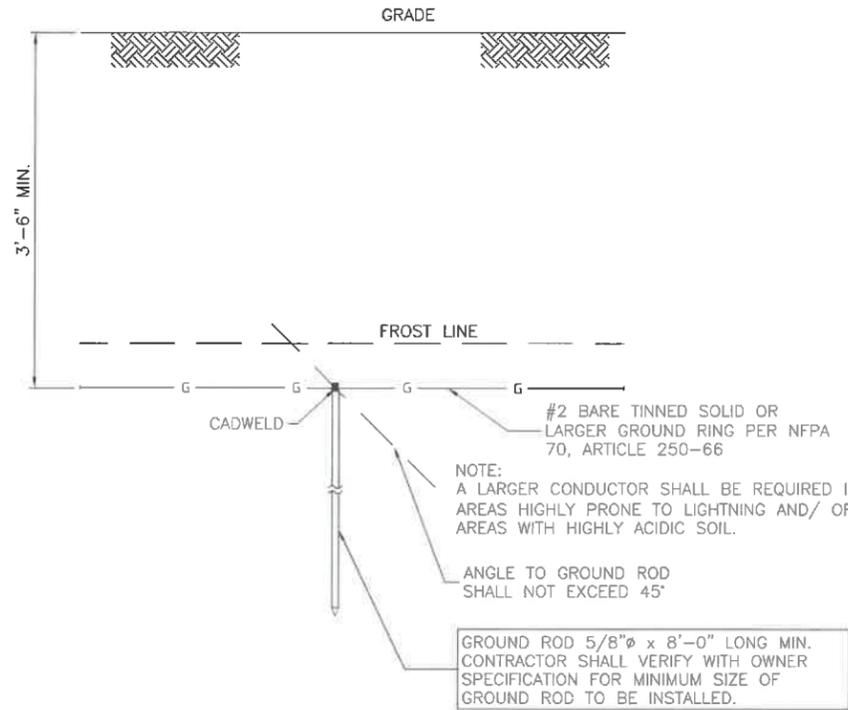
REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/15/20

CH42545B
LA GRANGE PARK WATER TANK
937 BARNSDALE RD
LA GRANGE PARK, IL 60526

Drawing Title:
**GROUNDING NOTES,
GROUNDING PLANS**

Project Number:	Drawn By: AS
Client Project Number:	Date:
Scale:	Checked By: PA
Drawing Number:	Date:
	Approved By: MS
	Date:

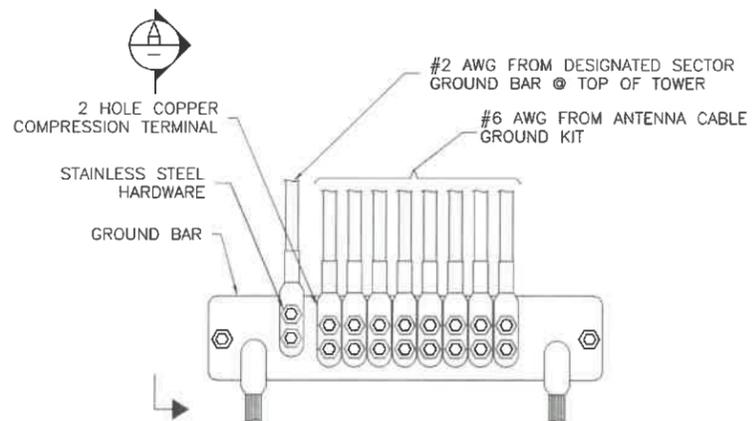
E-2



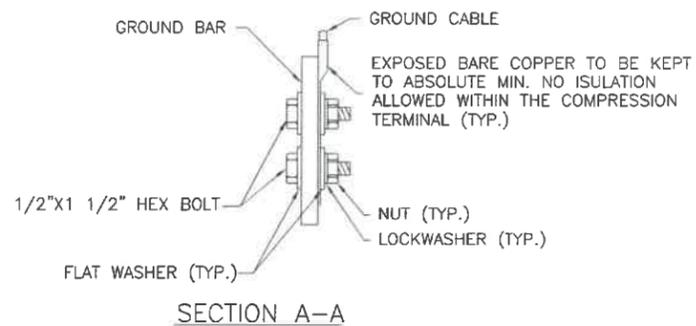
NOTES:

1. GROUND RODS MAY BE:
- COPPER CLAD STEEL
- SOLID COPPER
2. GROUND RODS SHALL HAVE A MAX. SPACING TWICE THE LENGTH OF ROD
3. SEE RESISTIVITY REPORT FOR VERIFICATION AS AVAILABLE
4. GROUND RODS INSTALLED WITHIN CLOSE PROXIMITY TO TOWER OR WHEN SOIL IS AT OR BELOW 2,000 OHM-CM, SHALL BE GALVANIZED TO PREVENT GALVANIC CORROSION OF TOWER (SEE ANSI/TIA-EIA-222-G)

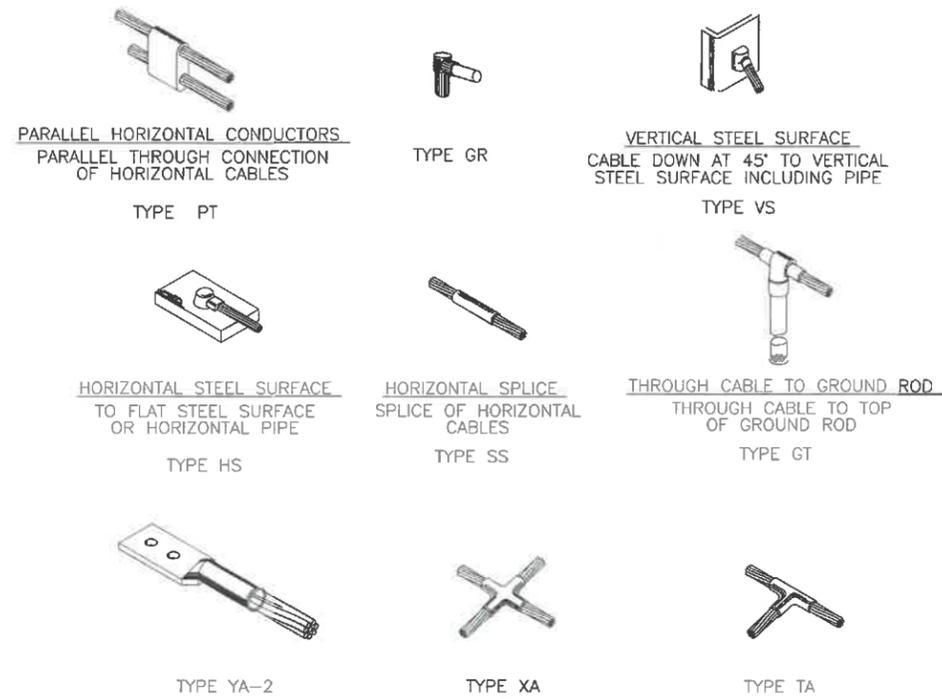
1 GROUNDING ROD (IF REQUIRED)
E-6 SCALE: N.T.S.



2 GROUNDING BAR CONNECTION
E-6 SCALE: N.T.S.

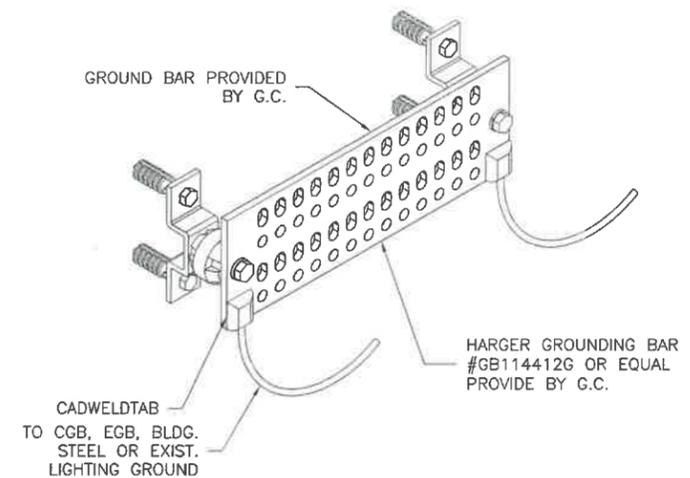


3 COLLECTOR GROUND BAR (CGB)
E-6 SCALE: N.T.S.



NOTE: CADWELD "TYPES" SHOWN ABOVE ARE EXAMPLES. CONSULT WITH PROJECT MANAGER FOR SPECIFIC TYPES OF CADWELDS TO BE USED FOR THIS PROJECT.

4 CADWELD TYPES
E-6 SCALE: N.T.S.



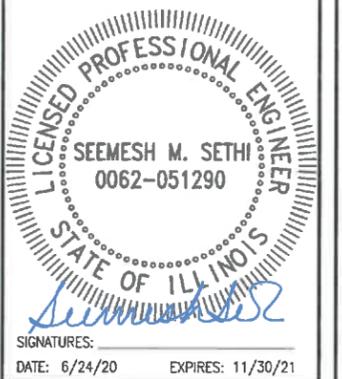
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Drawing Number:	Date:
	Approved by: MS
	Date:

E-3

DIVISION 1 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 INTENT

THESE SPECIFICATIONS AND CONSTRUCTION DRAWINGS ACCOMPANYING THEM DESCRIBE THE WORK TO BE DONE AND THE MATERIALS TO BE FURNISHED FOR CONSTRUCTION.

THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO BE FULLY EXPLANATORY AND SUPPLEMENTARY. HOWEVER, SHOULD ANYTHING BE SHOWN, INDICATED OR SPECIFIED ON ONE AND NOT THE OTHER, IT SHALL BE DONE THE SAME AS IF SHOWN, INDICATED OR SPECIFIED IN BOTH.

THE INTENTION OF THE DOCUMENTS IS TO INCLUDE ALL LABOR AND MATERIALS REASONABLY NECESSARY FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK AS STIPULATED IN THE CONTRACT.

THE PURPOSE OF THE SPECIFICATIONS IS TO INTERPRET THE INTENT OF THE DRAWINGS AND TO DESIGNATE THE METHOD OF THE PROCEDURE, TYPE AND QUALITY OF MATERIALS REQUIRED TO COMPLETE THE WORK.

MINOR DEVIATIONS FROM THE DESIGN LAYOUT ARE ANTICIPATED AND SHALL BE CONSIDERED AS PART OF THE WORK. NO CHANGES THAT ALTER THE CHARACTER OF THE WORK WILL BE MADE OR PERMITTED BY THE OWNER WITHOUT ISSUING A CHANGE ORDER.

1.2 CONFLICTS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AT THE SITE BEFORE ORDERING ANY MATERIALS OR DOING ANY WORK. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED DUE TO DIFFERENCE BETWEEN ACTUAL DIMENSIONS AND DIMENSIONS INDICATED ON THE CONSTRUCTION DRAWINGS. ANY SUCH DISCREPANCY IN DIMENSION WHICH MAY BE FOUND SHALL BE SUBMITTED TO THE OWNER FOR CONSIDERATION BEFORE THE CONTRACTOR PROCEEDS WITH THE WORK IN THE AFFECTED AREAS.

THE BIDDER, IF AWARDED THE CONTRACT, WILL NOT BE ALLOWED ANY EXTRA COMPENSATION BY REASON OF ANY MATTER OR THING CONCERNING WHICH SUCH BIDDER MIGHT HAVE FULLY INFORMED THEMSELVES PRIOR TO THE BIDDING.

NO PLEA OF IGNORANCE OF CONDITIONS THAT EXIST, OR OF DIFFICULTIES OR CONDITIONS THAT MAY BE ENCOUNTERED OR OF ANY OTHER RELEVANT MATTER CONCERNING THE WORK TO BE PERFORMED IN THE EXECUTION OF THE WORK WILL BE ACCEPTED AS AN EXCUSE FOR ANY FAILURE OR OMISSION ON THE PART OF THE CONTRACTOR TO FULFILL EVERY DETAIL OF ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS GOVERNING THE WORK.

1.3 CONTRACTS AND WARRANTIES

CONTRACTOR IS RESPONSIBLE FOR APPLICATION AND PAYMENT OF CONTRACTOR LICENSES AND BONDS.

SEE MASTER CONSTRUCTION SERVICES AGREEMENT FOR ADD'L DETAILS.

1.4 STORAGE

ALL MATERIALS MUST BE STORED IN A LEVEL AND DRY FASHION AND IN A MANNER THAT DOES NOT NECESSARILY OBSTRUCT THE FLOW OF OTHER WORK. ANY STORAGE METHOD MUST MEET ALL RECOMMENDATIONS OF THE ASSOCIATED MANUFACTURER.

1.5 CLEAN UP

THE CONTRACTORS SHALL AT ALL TIMES KEEP THE SITE FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR EMPLOYEES AT WORK AND AT THE COMPLETION OF THE WORK, THEY SHALL REMOVE ALL RUBBISH FROM AND ABOUT THE BUILDING AREA, INCLUDING ALL THEIR TOOLS, SCAFFOLDING AND SURPLUS MATERIALS AND SHALL LEAVE THEIR WORK CLEAN AND READY FOR USE.

EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER.

- 1. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
2. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.

INTERIOR:

VISUALLY INSPECT INTERIOR SURFACE AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER FROM WALLS/FLOOR/CEILING.

- 1. REMOVE ALL TRACES OF SPLASHED MATERIAL FROM ADJACENT SURFACES.
2. REMOVE PAINT DROPPINGS, SPOTS, STAINS AND DIRT FROM FINISHED SURFACES.

1.6 CHANGE ORDER PROCEDURE

CHANGE ORDERS MAY BE INITIATED BY THE OWNER AND/OR THE CONTRACTOR INVOLVED. THE CONTRACTOR, UPON VERBAL REQUEST FROM THE OWNER SHALL PREPARE A WRITTEN PROPOSAL DESCRIBING THE CHANGE IN WORK OR MATERIALS AND ANY CHANGES IN THE CONTRACT AMOUNT AND PRESENT TO THE OWNER WITHIN 72 HRS FOR APPROVAL. SUBMIT REQUESTS FOR SUBSTITUTIONS IN THE FORM AND IN ACCORDANCE WITH PROCEDURES REQUIRED FOR CHANGE ORDER PROPOSALS. ANY CHANGES IN SCOPE OF WORK OR MATERIALS WHICH ARE PERFORMED BY THE CONTRACTOR WITHOUT A WRITTEN CHANGE ORDER AS DESCRIBED AND APPROVED BY THE OWNER SHALL PLACE FULL RESPONSIBILITY OF THESE ACTIONS ON THE CONTRACTOR.

1.7 RELATED DOCUMENTS AND COORDINATION

GENERAL NOTES, CIVIL, STRUCTURAL, ELECTRICAL AND ANTENNA DRAWINGS ARE INTERRELATED. IN PERFORMANCE OF THE WORK; THE CONTRACTOR MUST REFER TO ALL DRAWINGS. ALL COORDINATION TO BE THE RESPONSIBILITY OF THE CONTRACTOR.

1.8 SHOP DRAWINGS

- A. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AS REQUIRED AND LISTED IN THESE SPECIFICATIONS TO THE OWNER FOR APPROVAL.
B. ALL SHOP DRAWINGS SHALL BE REVIEWED, CHECKED AND CORRECTED BY CONTRACTOR PRIOR TO SUBMITTAL TO THE OWNER.

1.9 PRODUCTS AND SUBSTITUTIONS

- A. SUBMIT 3 COPIES OF EACH REQUEST FOR SUBSTITUTION. IN EACH REQUEST IDENTIFY THE PRODUCT OR FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED SPECIFICATION SECTION AND DRAWING NUMBERS AND COMPLETE DOCUMENTATION SHOWING COMPLIANCE WITH THE REQUIREMENTS FOR SUBSTITUTIONS.
B. SUBMIT ALL NECESSARY PRODUCT DATA AND CUT SHEETS WHICH PROPERLY INDICATE AND DESCRIBE THE ITEMS, PRODUCTS AND MATERIALS BEING INSTALLED. THE CONTRACTOR SHALL, IF DEEMED NECESSARY BY THE OWNER SUBMIT ACTUAL SAMPLES TO THE OWNER FOR APPROVAL IN LIEU OF CUT SHEETS.

1.10 QUALITY ASSURANCE

ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. THESE SHALL INCLUDE BUT NOT BE LIMITED TO THE LATEST VERSION OF THE FOLLOWING:

- ANSI/EIA - 222 - G
INTERNATIONAL BUILDING CODE: 2012 IBC
ELECTRICAL CODE: 2014 NEC
UNDERWRITER LABORATORIES APPROVED ELECTRICAL PRODUCTS
AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATIONS (AISC)
LIFE SAFETY CODE NFPA - 101-2012

1.11 ADMINISTRATION

- A. BEFORE THE COMMENCEMENT OF ANY WORK, THE CONTRACTOR WILL ASSIGN A PROJECT MANAGER WHO WILL ACT AS A SINGLE POINT OF CONTACT FOR ALL PERSONNEL INVOLVED IN THIS PROJECT. THIS PROJECT MANAGER WILL DEVELOP A MASTER SCHEDULE FOR THE PROJECT WHICH WILL BE SUBMITTED TO THE OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK.
B. SUBMIT A BAR TYPE PROGRESS CHART NOT MORE THAN 3 DAYS AFTER THE DATE ESTABLISHED FOR COMMENCEMENT OF THE WORK ON THE SCHEDULE, INDICATING A TIME BAR FOR EACH MAJOR CATEGORY OR UNIT OF WORK TO BE PERFORMED AT SITE, PROPERLY SEQUENCED AND COORDINATED WITH OTHER ELEMENTS OF WORK AND SHOWING COMPLETION OF THE WORK SUFFICIENTLY IN ADVANCE OF THE DATE ESTABLISHED FOR SUBSTANTIAL COMPLETION OF THE WORK.

C. PRIOR TO COMMENCING CONSTRUCTION, THE OWNER SHALL SCHEDULE AN ON-SITE MEETING WITH ALL MAJOR PARTIES. THIS WOULD INCLUDE (THOUGH NOT LIMITED TO) THE OWNER, PROJECT MANAGER, CONTRACTOR, LAND OWNER REPRESENTATIVE, LOCAL TELEPHONE COMPANY, TOWER ERECTION FOREMAN (IF SUBCONTRACTED).

D. CONTRACTOR SHALL BE EQUIPPED WITH SOME MEANS OF CONSTANT COMMUNICATIONS, SUCH AS A MOBILE PHONE OR A BEEPER. THIS EQUIPMENT WILL NOT BE SUPPLIED BY THE OWNER, NOR WILL WIRELESS SERVICE BE ARRANGED.

E. DURING CONSTRUCTION, CONTRACTOR MUST ENSURE THAT EMPLOYEES AND SUBCONTRACTORS WEAR HARD HATS AT ALL TIMES. CONTRACTOR WILL COMPLY WITH ALL SAFETY REQUIREMENTS IN THEIR AGREEMENT.

F. PROVIDE WRITTEN DAILY UPDATES ON SITE PROGRESS TO THE OWNER.

G. COMPLETE INVENTORY OF CONSTRUCTION MATERIALS AND EQUIPMENT IS REQUIRED PRIOR TO START OF CONSTRUCTION.

H. NOTIFY THE OWNER / PROJECT MANAGER IN WRITING NO LESS THAN 48 HOURS IN ADVANCE OF CONCRETE POURS, TOWER ERECTIONS, AND EQUIPMENT CABINET PLACEMENTS.

1.12 INSURANCE AND BONDS

- A. CONTRACTOR SHALL AT THEIR OWN EXPENSE CARRY AND MAINTAIN FOR THE DURATION OF THE PROJECT ALL INSURANCE AS REQUIRED AND LISTED AND SHALL NOT COMMENCE WITH THEIR WORK UNTIL THEY HAVE PRESENTED AN ORIGINAL CERTIFICATE OF INSURANCE STATING ALL COVERAGES TO THE OWNER. REFER TO THE MASTER AGREEMENT FOR REQUIRED INSURANCE LIMITS.
B. THE OWNER SHALL BE NAMED AS AN ADDITIONAL INSURED ON ALL POLICIES.
C. CONTRACTOR MUST PROVIDE PROOF OF INSURANCE.

DIVISION 13 - SPECIAL CONSTRUCTION

13100 TOWER & ANTENNA INSTALLATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. INSTALL ANTENNAE AS INDICATED ON DRAWINGS AND OWNER SPECIFICATIONS.
B. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.
C. SUPPLY AND INSTALL ONE ISOLATED GROUND BAR AT EQUIPMENT CABINET.
D. SUPPLY AND INSTALL GROUNDING STRAP KITS WITH LONG BARREL COMPRESSION LUGS (SIM. TO ANDREW-223700TBD OR APPROVED EQUAL) ATOP TOWER BASE BEFORE ENTERING THE EQUIPMENT. GROUNDING STRAPS TO BE CONNECTED TO INSULATED GROUND BAR.
E. ASSIST OWNER TECHNICIANS IN PERFORMING SWEEP TEST OF INSTALLED COAX.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

- A. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE, INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.
B. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1.3 APPLICABLE STANDARDS

- A. EIA - ELECTRONIC INDUSTRIES ASSOCIATION EIA/TIA-222 - G STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.

B. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-IH, OBSTRUCTION MARKING AND LIGHTING.

C. FCC - FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES AND FORM 715A, HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.

D. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.

E. NATIONAL ELECTRIC CODE, 2014 - ON TOWER LIGHTING KITS.

F. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.

G. IN ALL CASES, PART 77 OR THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.

H. LIFE SAFETY CODE NFPA - 101-1997.

DIVISION 16 - GENERAL ELECTRIC

GENERAL ELECTRICAL PROVISION

- 1. SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
2. CONTRACTOR SHALL PERFORM ALL VERIFICATION OBSERVATION TEST, AND EXAMINATION WORK PRIOR TO THE ORDERING OF THE ELECTRICAL EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE ARCHITECT LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.
3. HEIGHTS SHALL BE VERIFIED WITH OWNER PRIOR TO INSTALLATION.
4. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
5. ELECTRICAL SERVICE SHALL BE 120/240 VAC SINGLE PHASE 3 WIRE 200 AMP SERVICE
6. EACH CONDUCTOR OF EVERY SYSTEM SHALL BE PERMANENTLY TAGGED IN EACH PANEL BOARD, PULL BOX, J-BOX, SWITCH BOX, ETC., IN COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.).
7. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
8. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. MATERIALS SHALL BE LISTED "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF THE DIVISION OF INDUSTRIAL SAFETY AND ALL GOVERNING BODIES HAVING JURISDICTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU.
9. ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED OR DIRECT BURIAL UNLESS OTHERWISE NOTED.
10. CONTRACTOR SHALL CARRY OUT THEIR WORK IN ACCORDANCE WITH ALL GOVERNING STATE, COUNTY AND LOCAL CODES AND O.S.H.A.
11. CONTRACTOR SHALL SECURE ALL NECESSARY BUILDING PERMITS AND PAY ALL REQUIRED FEES.
12. COMPLETE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.
13. ALL CONDUIT ONLY SHALL HAVE A PULL WIRE OR ROPE.
14. PROVIDE PROJECT MANAGER WITH ONE SET OF COMPLETE ELECTRICAL "AS INSTALLED" DRAWINGS AT THE COMPLETION OF THE JOB, SHOWING ACTUAL DIMENSIONS, ROUTINGS AND CIRCUITS.

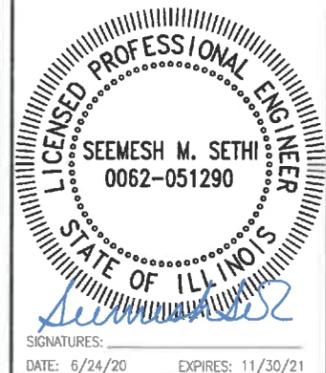


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Table with 3 columns: REV., DESCRIPTION, DATE. Row 0: ISSUED FOR PERMIT, 6/24/20. Row A: ISSUED FOR REVIEW, 6/15/20.

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NOTES

Table with 2 columns: Field, Value. Fields include Project Number, Client Project Number, Scale, Drawing Number, Drawn by, Date, Checked by, Date, Approved by, Date.

15. ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC., SHALL BE TURNED OVER TO THE OWNER AT JOB COMPLETION.

16. USE T-TAP CONNECTIONS ON ALL MULTI-CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURES.

17. ALL CONDUCTORS SHALL BE COPPER.

18. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C.

19. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.

20. PATCH, REPAIR AND PAINT ANY AREA THAT HAS BEEN DAMAGED IN THE COURSE OF THE ELECTRICAL WORK.

21. N/A

22. WIRE AND CABLE CONDUCTORS SHALL BE COPPER #12 AWG MINIMUM UNLESS SPECIFICALLY NOTED OTHERWISE ON DRAWINGS.

23. GROUNDING CONDUCTORS SHALL BE SOLID TINNED COPPER UNLESS OTHERWISE NOTED.

24. METER SOCKET AMPERES, VOLTAGE, NUMBER OF PHASES SHALL BE AS NOTED ON THE DRAWINGS, MANUFACTURED BY "SQUARE D COMPANY", OR APPROVED EQUAL.

25. ALL MATERIALS SHALL BE U.L. LISTED.

26. CONDUIT

A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3

B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTING SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.

C. FLEXIBLE METALLIC CONDUIT SHALL HAVE U.L. LISTED LABEL AND MAY BE USED WHERE PERMITTED BY CODE. FITTINGS SHALL BE "JAKE" OR "SQUEEZE" TYPE, SEAL TIGHT FLEXIBLE CONDUIT. ALL CONDUIT SHALL HAVE FULL SIZE EQUIPMENT GROUND WIRE.

D. N/A

E. PARALLEL UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 30" BELOW GRADE- STACKED UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 24" BELOW GRADE.

F. ABOVE GROUND CONDUIT SHALL BE P.V.C. SCHEDULE 80 (UNLESS NOTED OTHERWISE).

27. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS.

28. COORDINATE THE ELECTRICAL SERVICE WITH THE UTILITY COMPANY, AND PROVIDE DAILY UPDATES TO PM UNTIL FINAL ELECTRICAL SERVICE IS EFFECTED.

29. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUND TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION.

30. CONTRACTOR TO COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOKUP COSTS TO BE PAID BY CONTRACTOR.

GROUNDING STANDARDS

1. DEFINITIONS

AGB ANTENNA GROUND BAR

AWG AMERICAN WIRE GAUGE.

CAD WELDING:

AN EXOTHERMIC WELDING PROCESS WHICH CREATES POSITIVE CONTACT OF POSITIVE CONTACT OF GROUNDING CONDUCTORS

EMT ELECTRICAL METAL TUBING (LIGHT GAUGE METAL CONDUIT)

RGC RIGID GALVANIZED CONDUIT, SCH 40 OR HIGHER

PVC POLY VINYL CHLORIDE CONDUIT

MGB MASTER GROUND BAR

RFI RADIO FREQUENCY INTERFERENCE

THW LETTER TYPE DESIGNATION FOR CONDUCTOR INSULATION THAT IS A MOISTURE AND HEAT RESISTANT THERMOPLASTIC WITH A MAXIMUM OPERATING TEMPERATURE OF 75 DEGREES CELSIUS OR 167 DEGREES FAHRENHEIT.

T/I TENANT IMPROVEMENT

2. BACKGROUND

2.1. AREAS OF CONCERN: WHEN DESIGNING A GROUNDING SYSTEM FOR A MOBILE RADIO FACILITY THERE ARE FOUR INTERRELATED AREAS OF CONCERN. THE BASIC OBJECTIVE FOR EACH IS:

A. LIGHTNING PROTECTION - TO MAINTAIN ALL EQUIPMENT AT THE SAME POTENTIAL DURING A LIGHTNING IMPULSE.

B. RFI FOR NOISE INDUCTION CONTROL - TO ESTABLISH THE LOWEST POSSIBLE IMPEDANCE AMONG ALL EQUIPMENT.

C. ELECTROSTATIC CONTROL - TO REDUCE ELECTROSTATIC DISCHARGE PROBLEMS.

D. PERSONNEL SAFETY - TO MAINTAIN A MINIMUM VOLTAGE DIFFERENCE BETWEEN ANY TWO METALLIC OBJECTS WHICH PERSONNEL MIGHT CONTACT SIMULTANEOUSLY.

2.1. A/C GROUNDING:

IN THIS GROUNDING SYSTEM THE A/C SERVICE GROUND SHALL BE KEPT ISOLATED FROM THE EQUIPMENT FRAME WORK AND LIGHTNING PROTECTION GROUND SYSTEMS EXCEPT FOR ONE THIS WOULD TYPICALLY BE CONNECTING THE A/C SERVICE GROUND AT THE COMMERCIAL POWER RISER POLE DISCONNECT/METER BASE TO THE EXTERNAL GROUND RING. ALL GROUNDING CONNECTIONS INSIDE OF CABINETS SHALL BE SCRAPED TO BARE METAL AND COATED WITH NOALOX.

2.2. LIGHTNING CONSIDERATIONS:

LIGHTNING DAMAGE OCCURS FROM EITHER INDUCTION OR FROM AN ACTUAL DIRECT STRIKE TO THE BUILDING, USUALLY TAKEN THROUGH THE TOWER AND/OR ANTENNAS. STRIKES TO OTHER NEARBY OBJECTS INDUCE HIGH ENERGY INTO POWER OR TELEPHONE CABLES ENTERING THE BUILDING. THIS TYPE OF EFFECT HISTORICALLY CAUSES MOST OF THE DAMAGE TO THE BUILDING AND ITS CONTENTS.

3. STATION GROUNDING SYSTEM

3.1. MATERIALS:

A. #2 AWG, BARE SOLID TINNED COPPER WIRE, FOR ALL EXTERIOR CONDUCTORS AND TOWER GROUND BAR CONDUCTORS OR AS OTHERWISE SPECIFIED. GROUNDS TO THE LNAs SHALL BE NO. 6 STANDARD GREEN INSULATED JUMPERS. THE GROUND WIRE TO THE MGB SHALL BE GREEN JACKETED STRANDED #2 TINNED WIRE BURNDY CONNECTED TO THE BUSS BAR AND CONNECTED TO THE GROUND RING ON A GROUND ROD.

B. #2 AWG, INSULATED STRANDED COPPER CABLE IS ACCEPTABLE FOR INTERIOR GROUND BAR CONDUCTORS ON TENANT IMPROVEMENT SITES.

C. 5/8" Ø X 10' GROUND RODS OF SOLID COPPER, STAINLESS STEEL OR COPPER CLAD HIGH STRENGTH STEEL.

D. ABOVE GRADE CONNECTIONS SHALL BE BURNDY HYGROUND COMPRESSION. BELOW GRADE CONNECTIONS SHALL BE CAD WELD OR OTHER APPROVED EXOTHERMIC WELDING SYSTEM FOR BONDING AS SPECIFIED.

E. XIT OR ADVANCED GROUNDING ELECTRODE (AGE), ALL CHEMICAL GROUND RODS SHALL BE UL APPROVED.

F. SOLID COPPER PLATES OF MINIMUM 3'X3'X1/4" SIZE AS SPECIFIED.

G. NOALOX OR APPROVED EQUAL CONDUCTIVE MEDIUM MATERIAL SHALL BE USED IN ALL MECHANICAL CONNECTIONS.

H. #6 AWG STRANDED INSULATED (GREEN) FOR ALL INTERNAL EQUIPMENT GROUNDING.

I. MECHANICAL FASTENERS (I.E., DOUBLE LUGS, SPLIT BOLTS PARALLEL CONNECTORS) SHALL BE BRONZE, BRASS, COPPER OR STAINLESS STEEL AND HAVE NOALOX BETWEEN CONDUCTOR AND CONNECTION.

J. BOLTS, NUTS AND SCREWS USED TO FASTEN MECHANICAL CONNECTORS SHALL BE STAINLESS STEEL WITH STAR TYPE STAINLESS STEEL LOCK WASHERS.

K. ALL LUG TUBE FASTENERS SHALL PROVIDE TWO HOLES TO ALLOW A DOUBLE BOLT CONNECTION.

3.2 MASTER GROUND BAR (MGB):

THE PURPOSE OF THE MASTER GROUND BAR IS TO GROUND THE BTS AND ANY OTHER METALLIC OBJECTS AROUND THE BTS. IF AN MGB IS NOT PROVIDED WITH THE BTS, THE MGB SHALL BE AS FOLLOWS:

THE MGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4" LOCATED AS CLOSE TO THE BTS AS POSSIBLE. THE MGB SHALL HAVE A MINIMUM NUMBER OF 28 EACH 3/8" HOLES. GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. (2) #2 TINNED SHALL BE MECHANICALLY ATTACHED ((2) HOLE COMPRESSION LUG 3/8" HOLES, 1" CENTER TO CENTER SPACING) TO THE MGB AND DOWN LEADS THEN TAKEN THROUGH CONDUIT TO THE GROUND RING. THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT, (I.E. EXTERIOR GROUND RING OR BUILDING STEEL).

3.3 ANTENNA GROUND BAR (AGB):

THE PURPOSE OF THE ANTENNA GROUND BAR IS PRIMARILY FOR LIGHTNING PROTECTION. COAXIAL CABLE IS USUALLY THE ONLY ITEM GROUNDED TO THIS BAR. HOWEVER IT IS ACCEPTABLE TO BOND EXTERIOR; CABLE TRAY, WAVE GUIDE PORTS AND CANTILEVERED WAVE GUIDE BRIDGES TO THE AGB.

THE AGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4" ON WHICH THE COAXIAL CABLE FROM THE ANTENNAS ARE PRIMARILY GROUNDED. THERE SHALL BE TWO AGBS, ONE LOCATED AT THE TOP OF THE TOWER AT THE START OF THE VERTICAL RUN OF COAX, THE OTHER AT THE BOTTOM OF THE VERTICAL RUN OF COAX BEFORE IT MAKES ITS BEND. (IF THE TOWER IS OVER 200 THERE SHALL BE A THIRD AGB LOCATED AT THE MIDDLE OF THE TOWER). THE AGB SHALL HAVE A MINIMUM OF 28 EACH 3/8" HOLES. GROUND BARS SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. USE #2 AWG SOLID TINNED WIRE W/ 2-HOLE SHORT BARREL COMPRESSION LUGS 3/8" HOLES, 1" CENTER TO CENTER SPACING). THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT (I.E., EXTERIOR GROUND RING, OR BUILDING STEEL.)

3.4 SURGE ARRESTOR GROUND BAR: N/A

3.5 GROUND ROD AND GROUND RING PLACEMENT:

THE OUTSIDE GROUND RING SHALL BE PLACED AROUND THE BTS AT A DISTANCE OF TWO (2) FEET FROM THE BTS AT A DEPTH OF 3'-6" OR 6" BELOW THE FROST LINE, WHICHEVER IS DEEPER. RODS SHALL BE DRIVEN TO A DEPTH SUCH THAT THE TOP OF THE RODS IS AT THE LEVEL OF THE GROUND RING CONDUCTOR. THE RODS SHALL BE PLACED ALONG THE RING AT THE FOLLOWING LOCATIONS:

A. BELOW THE AREA OF THE INTERNAL MASTER GROUND BAR (MGB) FOR CONNECTION TO THE MGB.

B. NEAR THE CORNERS OF THE BTS.

C. AS REQUIRED TO ACHIEVE A MAXIMUM SPACING OF EIGHT (8) FEET BETWEEN GROUND RODS ALONG THE RING PERIMETER.

D. AS REQUIRED ALONG THE RING PERIMETER TO ACHIEVE 5 OHMS OR LESS RESISTANCE WHEN TESTED.

E. TWO RODS LOCATED ON OPPOSITE SIDES AT EACH TOWER LEG OR MONOPOLE.

F. ONE ROD LOCATED BENEATH EACH END OF THE WAVE GUIDE BRIDGE OR CABLE TRAY.

G. ONE ROD LOCATED ADJACENT TO THE STANDBY GENERATOR, AND IF SEPARATED BY MORE THAN EIGHT (8) FEET, ONE LOCATED ADJACENT TO THE FUEL TANK.

H. ONE ROD LOCATED AT THE BASE OF THE TOWER FOR THE AGB.

3.6 TOWER GROUNDING (IF REQUIRED):

ALL MONOPOLES SHALL HAVE TWO GROUND RODS (MINIMUM). ALL OTHER TOWERS SHALL HAVE TWO GROUND RODS PLACED AT THE BASE OF EACH TOWER LEG. EACH MONOPOLE OR TOWER LEG SHALL BE BONDED TO THE SYSTEM VIA TWO #2 BARE TINNED SOLID COPPER CONDUCTORS. BURNDY CONNECT THE CONDUCTORS TO ONLY STRUCTURAL BASE PLATES OR LUGS OR EARS AS MAY BE PROVIDED. NO BURNDY CONNECTIONS SHALL BE MADE TO THE VERTICAL WALLS OF THE STRUCTURE. NEVER GROUND TO HOLLOW LEG MEMBERS.

3.7 ANTENNA GROUNDING:

EACH ANTENNA COAXIAL CABLE SHALL TYPICALLY BE GROUNDED AT THREE POINTS USING A HARD-SHELL COAXIAL CABLE KIT FROM THE MANUFACTURER OF THE ANTENNA CABLE. A TYPICAL INSTALLATION SHALL BE AS FOLLOWS:

A. THE FIRST GROUND CONNECTION SHALL OCCUR AS CLOSE TO THE ANTENNA AS POSSIBLE, BELOW THE FIRST POINT THE COAX CABLE BEGINS TO RUN VERTICAL DOWN THE TOWER. THIS GROUND SHALL TERMINATE DIRECT TO THE TOP AGB. ON A T/I, GROUND TO THE AGB AT THE ANTENNA MOUNTS.

B. THE SECOND GROUND SHALL BE MADE AT THE BOTTOM OF THE VERTICAL RUN OF THE COAXIAL CABLE AS IT TURNS OUT AWAY FROM THE TOWER TOWARDS THE BTS. THIS GROUND SHALL BE TERMINATED AT THE GROUND BAR AT BASE OF TOWER. THE GROUND BAR SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

C. THE THIRD GROUND SHALL BE MADE PRIOR TO COAX ENTRY INTO BTS. THE GROUND WIRE SHALL BE TERMINATED AT THE MASTER GROUND BAR SHALL MASTER GROUND BAR. HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

3.13 GENERATOR RECEPTACLE GROUNDING:

THE GENERATOR RECEPTACLE (HUBBLE PLUG) SHALL BE GROUNDED TO THE EGR.

3.14 COAX BRIDGE / CABLE TRAY GROUNDING :

BOND THE COAX BRIDGE OR CABLE TRAY TO THE AGB WITH #2 SOLID TINNED GROUND WIRE. THESE CONNECTIONS SHALL BE DOUBLE LUG BOLTED / SCREWED MECHANICAL CONNECTIONS WITH STAR LOCK WASHERS AND NOALOX. ALL BRIDGE SPLICES SHALL HAVE JUMPERS OF #2 SOLID WITH COMPRESSION LUGS.

3.15 CAD WELD & BURNDY CONNECTION:

CAD WELDS (EXOTHERMIC WELDS) AND BURNDY CONNECTIONS SHALL BOND ALL UNDERGROUND AND DAMP LOCATION CONNECTIONS, SHELTER SKID GROUNDS, TOWER OR MONOPOLE GROUNDS, FENCING CORNER AND AND GATE POSTS, ANTENNA GROUND BARS, (AGB) SURGE ARRESTER GROUND BAR, AND THE MASTER GROUND BAR (MGB). MECHANICAL CONNECTIONS SHALL BE TYPICALLY USED TO BOND ALL INTERIOR EQUIPMENT, COAX CABLE BRIDGES AND COAXIAL CABLE GROUND KITS. ALL LUG TYPE MECHANICAL CONNECTORS TO THE MGB OR AGB SHALL BE TWO HOLE TYPE CONNECTED WITH STAINLESS STEEL BOLTS AND NUTS WITH STAINLESS STEEL LOCK WASHERS AND NOALOX ON EITHER SIDE OF THE BUSS BAR.

3.16 CHEMICAL GROUND RODS (IF REQUIRED):

CHEMICAL GROUND RODS SHALL NOT BE INSTALLED ON GROUND RING INSTALLATIONS WITH NORMAL SOIL. CHEMICAL GROUND RODS SHALL BE INSTALLED ONLY FOR SPECIAL DESIGN APPLICATIONS THAT REQUIRE SINGLE POINT GROUNDING DUE TO SPECIFIC SITE CONDITIONS.

3.17 TENANT IMPROVEMENT SITE GROUNDING:

N/A

3.18 LIMITS OF BEND RADIUS:

IT IS IMPORTANT THAT THE GROUNDING CONDUCTOR CONNECTING THE INSIDE AND OUTSIDE GROUND SYSTEMS BE AS STRAIGHT AS POSSIBLE, WITH NO TURN OR BEND SHORTER THAN ONE FOOT RADIUS WITH A THREE FOOT RADIUS PREFERRED. NO RIGHT ANGLE OR SHARP BENDS SHALL BE ALLOWED.

3.19 BONDING PREPARATION & FINISH:

ALL SURFACES REQUIRE PREPARATION PRIOR TO BONDING OF EITHER CAD WELD OR BURNDY FASTENERS. GALVANIZED SURFACES SHALL BE GROUND OR SANDED TO THE POINT OF EXPOSING THE STEEL SURFACE BELOW, PRIOR TO BONDING THE GROUND CONDUCTOR. FOR OTHER SURFACES INCLUDING COPPER BUSS BARS ALL PAINT, RUST TARNISH AND GREASE SHALL BE REMOVED PRIOR TO BONDING THE GROUND CONDUCTOR. CAD WELD TYPE BONDS SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND WHEN APPLICABLE, FINISH PAINTED WITH AN APPROPRIATE COLOR AS REQUIRED. MECHANICAL TYPE BONDS ON BUSS BARS SHALL BE FINISHED WITH THE APPLICATION OF NOALOX OR OTHER APPROVED CONDUCTIVE MEDIUM MATERIAL BETWEEN CONNECTOR AND BUSS BAR. MECHANICAL TYPE BONDS ON ALL OTHER SURFACES SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND OR THE APPROPRIATE PAINT TO MATCH AS REQUIRED.

3.20 TESTING:

THE OUTSIDE GROUND RING SHALL BE TESTED AFTER INSTALLATION BUT PRIOR TO BACKFILLING THE GROUND RING TRENCH. THE GROUND FIELD RESISTANCE SHALL MEASURE 5 OHMS OR LESS TO GROUND. ANY DIFFICULTY IN ACHIEVING THIS LEVEL OF RESISTANCE MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT MANAGER. THE RESISTANCE TO GROUND SHALL BE MEASURED USING THE FALL OF POTENTIAL METHOD. TESTING SHALL BE PERFORMED BY AN OWNER PROVIDED INDEPENDENT TESTING LABORATORY FROM WHICH A WRITTEN REPORT SHALL BE PRODUCED FOR REVIEW BY THE PROJECT MANAGER.

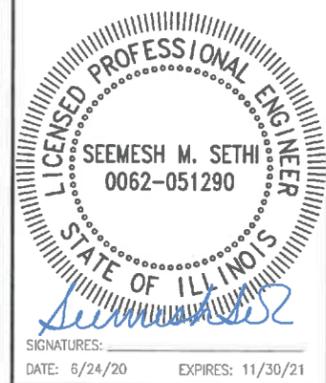


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0	ISSUED FOR PERMIT	6/24/20
A	ISSUED FOR REVIEW	6/15/20

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