Presentation to McHenry County College Crystal Lake, IL

FM/TV Broadcast Facility to include 1–1500 ft Self Supporting Tower

BMB COMMUNICATIONS MANAGEMENT, LLC

February 18, 2009
BMB Communications Management, LLC was formed in 2003 as an Oklahoma Limited Liability Company. It is owned by 3 partners, John Maguire, Jason Bradshaw and Ronald Bradshaw.

BMB has constructed, owned, operated and managed over 30 towers in the United States.

BMB’s clients have included broadcast companies such as College Creek Media LLC, Aurora Media LLC, M&M Broadcasting LLC, Sky Media LLC, Portland Broadcasting LLC and Resurgence Media LLC.
Economic Benefits

The construction of the site alone will greatly benefit the local economy. BMB will use local vendors when possible for some of the following construction work.

- Concrete
- Electrical
- Excavation and Fencing
- Miscellaneous Civil Work
Alan D. Kirshner
Engineering experience

- 37 Years Broadcast Engineering Experience
- FCC First Class Radiotelephone Operators License held since 1973

Past Projects:
- Design and installation-former World Trade Center
- Design and installation-Empire State Building
- Design and installation-Stratosphere (Las Vegas, NV)

Licenses Held

- FCC General Class Radio Telephone License with Ship Radar Endorsement
- FCC Amateur Radio Operator License
- FAA Private Pilot Certificate (own plane)
- New York State Private Trade School Teachers Certificate
Why McHenry County College?

- Reasons for the location of the 1500’ Tall Tower
  - Meets Federal Communications Commission’s Spacing Requirements for FM stations proposed to be located there.
    - The FCC has minimum spacing requirements that FM stations must meet.
  - Semi-rural area has the vacant land needed for this tower.
  - Signal coverage from the site chosen will enable the station to be economically feasible
    - A shorter tower would not provide the desired signal level over the needed population.
  - Outside the O’Hare Airspace.
Improved Coverage

• Improved Coverage for Stations Will Result In:

  – Better coverage for populated areas North and West of Chicago
  – Additional choices for listeners in high growth areas
  – A chance for small business owners to have an outlet for advertising
  – Additional local communities receiving first aural services
    • Resulting in better news and public service coverage of these communities
  – Most Importantly, better **EMERGENCY SERVICES COVERAGE** of West Metro Communities that are not now being served
    • Severe Weather Alerts
      – Tornado Warnings
      – Flood Warnings
      – Lightning Storm Warnings
      – Blizzard Warnings
    • Hazardous Material Spills
    • Amber Alerts
Coverage From Proposed Location

Coverage Comparison with Population Density
Red Contour- Example of Current Coverage
Blue Contour- Coverage from Proposed Site
Radiofrequency
Electromagnetic Exposure
FCC FM Model for Calculating Radio Frequency
The FCC Program shows that a maximum Power Density of 0.2502 µW/cm² at a distance of 1,746 meters or 5,726.9 feet from the base of the tower. The study was performed using an Electronics Research, Incorporated SHPX-4AC-HW antenna designed with 4 radiating bays spaced ½ wavelength apart. This antenna was chosen for, among other things, its very low downward radiation characteristics in the immediate vicinity of the tower. This graph shows that there will be virtually no radiation at the base of the tower and negligible radiation even at the maximum value shown.
Electronics Research, Inc. SHPX-4AC-HW Antenna Specifications

- Left picture shows the mechanical specifications of the SHPX-4AC-HW antenna proposed.
- Right picture shows the Vertical Plane Plot (downward radiation) characteristics of the SHPX-4AC-HW antenna
  - The vertical axis depicts the relative field voltage.
  - As can be seen, the relative field approaches 0 at the base of the tower.
  - The horizontal axis shows the number of degrees below the horizontal plane of the antenna.
FCC OET Bulletin 56
Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields
August 1999

- The following slide contains information take from the FCC’s OET Bulletin 56
FCC OET Bulletin 56
Questions and Answers about Biological Effects and Potential Hazards of Radio-frequency Electromagnetic Fields

- The previous graphs calculated using the FCC’s FM Model Program showed a maximum Power Density of 0.2502 µW/cm²

- The information supplied in Table 1 (A) of the FCC’s OET Bulletin 56 shows the limit for Occupational/Controlled to be 1 mW/cm² (1000 µW/cm²)
  - Therefore the maximum Power Density of this antenna will represent only 0.025% of the maximum allowed for Workers in the vicinity of the tower.

- The information supplied in Table 1 (B) of the FCC’s OET Bulletin 56 shows the limit for General Public/Uncontrolled to be 0.2 mW/cm² (200 µW/cm²)
  - Therefore, the maximum Power Density for this antenna will represent only 0.125% of the maximum allowed for the General Public

- To protect workers in the vicinity of the tower or antenna where the Power Density exceeds the maximum values allowed (over 100%), the FCC adds the following language to all AM, FM and TV Licenses (A copy of a typical FCC license is in the next slide)
  - The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic fields in excess of FCC guidelines.

Table 1. FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

<table>
<thead>
<tr>
<th>Frequency Range (MHz)</th>
<th>Electric Field Strength (E) (V/m)</th>
<th>Magnetic Field Strength (H) (Am)</th>
<th>Power Density (P) (W/m²)</th>
<th>Averaging Time (E or H) or (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3-3.0</td>
<td>61.4</td>
<td>1.03</td>
<td>0.0015</td>
<td>6</td>
</tr>
<tr>
<td>3.0-30</td>
<td>104.2</td>
<td>2.06</td>
<td>0.002</td>
<td>6</td>
</tr>
<tr>
<td>30-300</td>
<td>62.6</td>
<td>1.03</td>
<td>0.002</td>
<td>6</td>
</tr>
<tr>
<td>300-1500</td>
<td>--</td>
<td>--</td>
<td>0.002</td>
<td>6</td>
</tr>
<tr>
<td>1500-100,000</td>
<td>--</td>
<td>--</td>
<td>0.002</td>
<td>6</td>
</tr>
</tbody>
</table>

(B) Limits for General Population/Uncontrolled Exposure

<table>
<thead>
<tr>
<th>Frequency Range (MHz)</th>
<th>Electric Field Strength (E) (V/m)</th>
<th>Magnetic Field Strength (H) (Am)</th>
<th>Power Density (P) (W/m²)</th>
<th>Averaging Time (E or H) or (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3-3.34</td>
<td>61.4</td>
<td>1.03</td>
<td>0.0015</td>
<td>36</td>
</tr>
<tr>
<td>1.34-30</td>
<td>104.2</td>
<td>2.06</td>
<td>0.002</td>
<td>36</td>
</tr>
<tr>
<td>30-300</td>
<td>62.6</td>
<td>1.03</td>
<td>0.002</td>
<td>36</td>
</tr>
<tr>
<td>300-1500</td>
<td>--</td>
<td>--</td>
<td>0.002</td>
<td>36</td>
</tr>
<tr>
<td>1500-100,000</td>
<td>--</td>
<td>--</td>
<td>0.002</td>
<td>36</td>
</tr>
</tbody>
</table>

*NOTE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided these persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations where an individual is transported through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.*

*NOTE 2: General population/uncontrolled exposure apply in situations in which the general public may be exposed or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.*
Typical FCC License for Multi-User Antenna Site
Note Special Operating Condition 1
FAA Guidelines

Site ID Number: West Chicago Tower

AERONAUTICAL RECOMMENDATIONS

Notice to the FAA is mandatory.

Proposed structure is located within a terminal procedure area. Recommend Form 7460-1 be filed with the Federal Aviation Administration.

TERPS® analysis has been completed for the proposed site. The maximum allowable height identified is 1439 feet AMSL. Due to the VOR missed approach on Runway 26 at 3CK:LAKE IN THE HILLS

The height of the proposed structure will exceed obstruction standards. The FAA will require an extended study to determine the aeronautical impacts. The maximum not to exceed height to avoid an extended study by the FAA is 1169 feet AMSL.

Marking and Lighting of the proposed structure is required.

IFR flight operations impact with a low altitude federal airway.

No impact to VFR Traffic Pattern Airspace.

FCC Licensed AM Broadcast Station interference identified.
Government Approvals and Permits

- The Federal Aviation Administration
- The Federal Communication Administration
- NEPA (National Environmental Policy Act)
- Local zoning
- Federal, state and local permitting
Cabin Canyon, NV: This tower was built on Bureau of Land Management Land near Mesquite, NV. It is 190’ and was built for four FM broadcast stations.
**Senator MT.**

**Senator Mt, AZ:** This tower was built for two FM broadcast stations at close to a 4,000’ elevation. The tower is 199’ high, with a 12’ X 20’ transmitter building. BMB constructed over 7 miles of new mountain road to access the site.
Portland, OR: This tower is a 550 ft Self Supporting tower built on State of Oregon Forestry Land. It has a 20’x20’ transmitter building and sits on a 100’x 80’ compound.
Mr. Ernie Jones, VP of Engineering - Structural Division, Electronic Research, Inc.

- Designs and fabricates steel structures such as the 1500 ft tower we are discussing.
- PE (Professional Engineers) Licenses held 19 states.
- 36 years of experience.
Tall Tower Presentation
for
Ernest R. Jones, P.E.
VP Engineering ERI
2–18–2009
Self Supporting Towers
Typical Guyed Towers
Typical Guy Anchors
FM Panel Top Mount
Self Supporting Towers
Self Supporting Towers
Self Supporting Towers
Self Supporting Towers
Built-Up Tower Leg
Tower on Empire State Building
New York
Tower on 4-Times Square Building
New York
Towers on John Hancock Building
Chicago
Eiffel Tower
Various Tall Structures

New York plans for tallest structure

Broadcasters are proposing to build a $200 million TV tower to replace the antenna lost when the World Trade Center towers collapsed.

1 - includes antenna

1,185 feet Empire State building, New York

1,454 feet Empire State building, New York

1,483 feet Petronas Towers 1&2, Malaysia

2,000 feet Proposed antenna

1,728 feet Former World Trade Center north tower

986 feet Eiffel Tower, Paris

Source: USA TODAY research; rendition by Peter Coe

By Quin Tian, USA TODAY
MAX. CORNER REACTIONS AT BASE:

DOWN: 1000 kN
UP: 740 kN
SHEAR: 570 kN

AXIAL 1407 kN
MOMENT 2892 kip-ft
TORSION 391 kip-ft
SHEAR 291 kN
TORQUE 1 kip-ft

MAKES: GROUND REACTIONS AT BASE:

DOWN: 1000 kN
UP: 740 kN
SHEAR: 570 kN

AXIAL 1407 kN
MOMENT 2892 kip-ft
TORSION 391 kip-ft
SHEAR 291 kN
TORQUE 1 kip-ft

TOWER DESIGN NOTES

1. Tower is located in McHenry County, Illinois.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic snow load with 0.75 in. ice, as is considered to increase the wind effects.
5. Deflections are based upon a 60 mph wind.
6. Failure due to Design of tower:
   - ERI 15 Day Factor: FM Antenna
   - Y: 40.256 kN, M: 37,000 kN, M: 1,130,400 kip-ft
   - Ice: Y: 40.000 kN, M: 37,000 kN, M: 1,130,400 kip-ft
   - Service X: 40.000 kN, Y: 16.000 kN, M: 537,000 kip-ft
Tower Design with over a dozen load cases each with 12 wind directions around the structure.

Wind Criteria – 90 mph at Ground Increasing to 118 mph above 900’

Wind With Ice – 40 mph with ¾” ice
40 mph at Ground – 52 mph at Top
1.5” ice at Ground – 2.5” ice at top
Tower Plot:

136’ Center to Center on Tower Legs

Plot Size Approximately 200’ x 200’
Proto-Type Tower Foundation

184’ x 172’ Outer Dimensions of Foundation

Estimated 1,600 Cu. Yds. of Concrete
Falling Ice
### Table 3 — Ice classes for glaze (ICG) (density of ice = 900 kg/m³)

<table>
<thead>
<tr>
<th>Ice class (IC)</th>
<th>Ice thickness, t (mm)</th>
<th>Masses for glaze, m_t, kg/m²</th>
<th>Cylinder diameter, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>G1</td>
<td>10</td>
<td>0.6</td>
<td>1.1</td>
</tr>
<tr>
<td>G2</td>
<td>20</td>
<td>1.7</td>
<td>2.8</td>
</tr>
<tr>
<td>G3</td>
<td>30</td>
<td>3.4</td>
<td>5.1</td>
</tr>
<tr>
<td>G4</td>
<td>40</td>
<td>5.7</td>
<td>7.9</td>
</tr>
<tr>
<td>G5</td>
<td>50</td>
<td>8.5</td>
<td>11.3</td>
</tr>
<tr>
<td>G6</td>
<td>To be used for extreme ice accretions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 28 — Recommended maximum distance for falling ice

<table>
<thead>
<tr>
<th>IC</th>
<th>Maximum distance for falling ice</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0 to R3</td>
<td>G0 to G1 normally not considered a)</td>
</tr>
<tr>
<td>R4 to R6</td>
<td>G2 to G3 2/3 of structure height</td>
</tr>
<tr>
<td>R7 to R8</td>
<td>G4 to G5 Equal to structure height</td>
</tr>
<tr>
<td>R9 to R10</td>
<td>1½ times structure height</td>
</tr>
</tbody>
</table>

a) Even in IC R2, R3 and G1, some ice on the structure can be a risk for people moving about near the structure. The area should then be closed in the rare events of risk due to falling ice.
• There is very little information about the area at a site which can be hit by shedding ice.

• It depends strongly on the structure and form of the ice in question and the actual wind speeds occurring during shedding events.

• The actual wind direction decides the direction of falling ice. When a piece of ice is released from a structure, gravity and wind drag determine its trajectory.

• Exact trajectories are difficult to predict because ice pieces are of different sizes, densities and shapes.

• The higher the wind speeds and the smaller the ice shape dimension the longer is the distance between the structure and the impact location of ice on the ground.
ICE ZONE AREAS

Red Zone – 150’ From Center of Tower
Orange Zone – 150’ to 300’ From Center of Tower
Green Zone – 300’ to 600’ From Center of Tower
Blue Zone – 600’ to 1000’ From Center of Tower
Red Zone – 150’ From Center of Tower
- This Zone is Potential High Impact Zone if Winds are Moderate
- Should be Marked off if Detrimental Icing Occurs
- Roofs and Walkways Should have Ice Protection
- Autos Should Not Park in this Area

Orange Zone – 150’ to 300’ From Center of Tower
This Zone Should be Considered a Moderate Impact Zone
A Warning for this Area is Recommended, Especially in the Event of High Winds or Gusty Winds. A Program Based on Site Experience of Alerting Personnel of Ice Hazards and Appropriate Protection Should be Implemented.

Green Zone – 300’ to 600’ From Center of Tower
In This Zone Expect – Large Pieces of Ice Travelling Out is Not Expected. Ice that is Lighter and in More of a Sheet Form is the Most Expected in this Area During Gusty Wind Conditions.

Blue Zone – 600’ to 1000’ From Center of Tower
In this Area we Expect Lighter Pieces of Ice Similar to Hail Conditions, if Winds are High and/or Gusty.
Tower Fall Radius

• Unless a special design is implemented it is possible for a Self Supporting Tower to fall in a near layout condition!
Self Supporting Tower
Catastrophic Layout Type Failure
Folding of Tower Mast
Design with “First to Yield Section Concept”
First To Yield Sections

eiffel tower, paris
They Built the Eiffel Tower over 100 Years Ago
We Can Build this One
And We Can Build it Safely
Tower Industry Construction Standard

DRAFT DO NOT DISTRIBUTE

ANSI/TIA STANDARD

Structural Standards for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas

TIA-1019 (Draft)

Telecommunications Industry Association
TR14.7 Sub-committee
Safety Facilities Task Group
Lower Sections Will Be Pieced Together with Ground Mounted Cranes
Gin Pole Use for Tall Structures

Ernie Jones, Chairman TIA-1019 Standard
Tilted Gin Pole Inside Tower

Gin Pole Inside Tower

Gin Pole Inside Tower
Gin Pole Positioned Outside of Tower

Gin Pole

Tower

Section Being Lifted

Gin Pole
Sequence of Turning a Lifted Load With Gin Pole
Questions?

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