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Think, Plan,... Progress!

Telecommunications Facility Design for Coastal Labrador

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Project Introduction and Scope

- Telecommunications Facility Design in coastal Labrador. Includes:
  - 24.4m (80 ft) self supporting antenna tower and foundation
  - 18.3m (60 ft) monopole and foundation to support a wind turbine
  - 6.1m (20 ft) by 9.1m (30 ft) steel framed telecommunication shelter with foundation
  - Helicopter landing pad

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Presentation Outline

- Background Information
- Preliminary Concepts
- Discussion and Decision of Concepts
- Preliminary Site Layout
- Preliminary Cost Estimate
- Remaining Tasks

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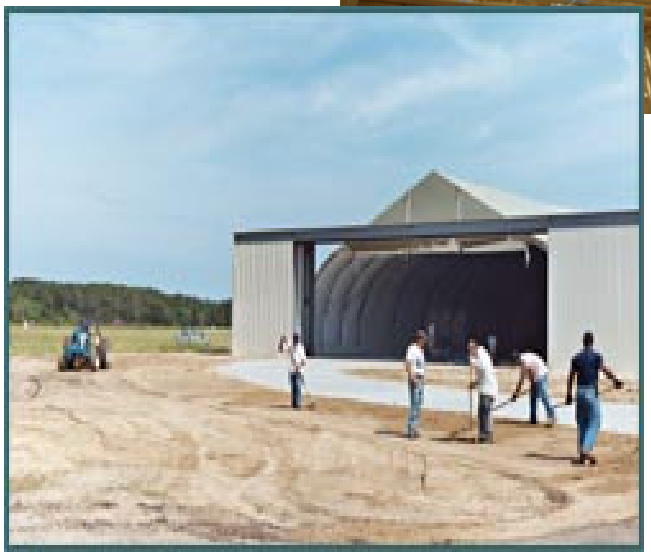
Background Information - Building

- Wood Framed Structures

- Concrete Framed Structures



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Background Information - Building

- Steel Framed Structures

- Pre-Fabricated Buildings

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Background Information – Helicopter Landing Pad

- Raised platform landing pads
  - Fitted to land contours using varying support column heights
- On grade landing pads
  - Typically asphaltic or Portland Cement concrete, requiring heavy equipment
- Commonly used materials: steel, aluminum, or wood
- Shape varies according to desired use

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Background Information – Communication Tower

- Two main options:
  - Guyed tower
    - Supported by guy wires
    - Requires great deal of land (not available in this location)
  - Self-support tower
    - Tapered tower, supported by size of base
    - Much smaller footprint

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Background Information – Communication Tower (Cont.)

- Tower shape:
  - 4 legged, square towers
  - 3 legged, triangular towers
- Tower leg options:
  - Hollow tubular legs
    - Good for air flow and icing considerations
  - Angular legs
    - Most commonly used in Newfoundland and Labrador due to corrosion inspection issues
  - Solid round legs
    - Uncommon because of strength to weight ratios

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Background Information – Wind Turbine Tower

- Guyed tubular steel tower
  - Used for small, down-wind turbines
  - Supported by steel guy cables
  - Inexpensive installation and material costs
- Monopole
  - Hollow, tapered structure, most commonly constructed of steel
  - Common type of tower in areas where space is at a premium due to very small footprint

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Preliminary Concepts - Building

Concept Design	Advantages	Disadvantages
Wood framed building	Light weight for transport to site. Inexpensive in comparison to steel.	Not as strong as steel. Takes labour and time to assemble.
Steel framed, custom designed building	High strength. Have ability to optimize design to use less material.	Takes labour and time to assemble.
Steel framed, pre-fabricated building	Quick and relatively easy assembly. Requires very little labour.	May not be able to reduce weight to be carried by helicopter.

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Preliminary Concepts – Helicopter Pad

Concept Design	Advantages	Disadvantages
Steel framed	High strength	Heavy for transport to site. May be difficult to assemble. May have corrosion issues.
Wood framed	Light weight for transport to site. Easy to assemble.	Not as strong as steel

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Preliminary Concepts – Communication Tower

Concept Design	Advantages	Disadvantages
4-legged, square tower with angular legs	Angular legs provide ability to check properly for corrosion	Higher ice accumulation and wind turbulence for angular legs. More maintenance required. Susceptible to twisting.
3-legged, triangular tower with angular legs	Less maintenance, assembly time, and material. Ability to check properly for corrosion.	Higher ice accumulation on angular legs. More wind turbulence caused by angular legs.
3-legged, triangular tower with round tubular legs	Less ice accumulation and wind turbulence on round legs.	Cannot properly examine tubular legs for corrosion.

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Preliminary Concepts – Wind Turbine Tower

Concept Design	Advantages	Disadvantages
Hollow steel tapered monopole	Requires little land.	Usually used for large wind turbines. More expensive than necessary for this type of turbine.
Guyed pole tower	Very inexpensive. Easy to assemble.	Requires more land

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Final Concept Selection

- Building
  - Steel framed, pre-fabricated building
- Helicopter Pad
  - Square, wood framed pad
- Communication Tower
  - 3-legged triangular tower with angular legs
- Wind Turbine Tower
  - Guyed pole

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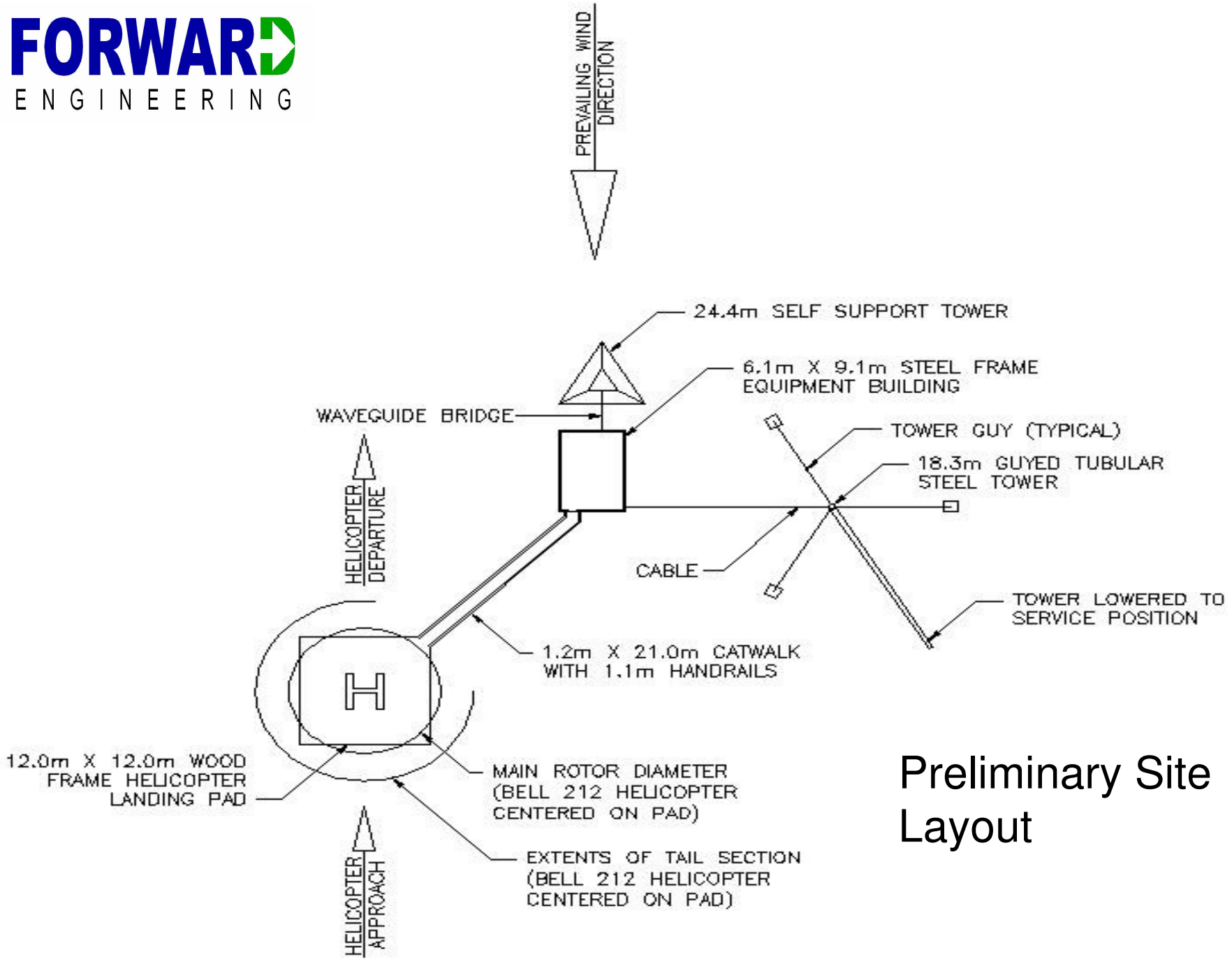

Preliminary Site Layout

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Preliminary Cost Estimate

	Unit	Cost per unit	Total Cost
Building			
20 foot by 30 foot including foundation	1	$70,000.00	$70,000.00
Communication Tower			
80 ft Steel Lattice	1	$125,000.00	$125,000.00
Additional Cost for Remote Site	1	$62,500.00	$62,500.00
Steel Monopole			
Material and Fabrication	1	$75,000.00	$75,000.00
Additional Cost for Remote Site	1	$37,500.00	$37,500.00
Helicopter Pad			
40 foot by 40 ft pad including foundation	1	$26,000.00	$26,000.00
Transportation Costs	12	$4,000.00	$48,000.00

Labor Cost (10 %)	$44,400.00
Maintenance (5%)	$22,200.00
Cost	$510,600.00
Contingicies (10%)	$51,060.00
Capital Cost	$561,660.00
HST	$78,632.40
Total Cost	$640,292.40

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Remaining Tasks

- Selection of wind turbine
- Structural analysis of all structures
- Detailed design of all structures
- AutoCad drawings for all members and connections
- Foundation design
- Final Cost estimates

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Questions?