Sunshine Skyway Health Monitoring

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Outline

• Skyway Background
• Existing Monitoring System
• Future Monitoring System
  – Data Acquisition
  – Sensor Types
• Structural Health Monitoring Goals
Sunshine Skyway Background

- Cable stayed and PT segmental concrete construction
-Opened in 1987
Sunshine Skyway Bridge Location
Current Monitoring System

- GPS Receivers
- Automatic Total Stations
- Weather Stations
- Analytical Model
GPS System

- Current GPS Sensors
  - Leica RS500 Receivers
  - L1/L2 Signal Reception
  - Post-processed accuracy of 1 centimeter in x and y planes
GPS Receiver Locations
Future GPS Upgrade

- Upgraded Leica GPRX 1200+ system included in current rehabilitation project
- GLONASS/Galileo/Compass compatible
- New system running by end of 2011
Automatic Total Stations

- Leica TCA2003 ATS on Dolphin 101
- One additional ATS to be added
- Accuracy to 1 millimeter
- Redundancy for GPS
ATS Lines of Sight
Weather Station

• Weather Sensors
  – Wind Speed/Direction
  – Temperature/Humidity
  – Barometric Pressure
  – Internet-connected with live web-cams
Weather Station

- Datalogger System
  - Expandable channels
  - 100 Hz max sampling
  - Expandable for a variety of sensors
  - Wireless radio capabilities
Weather Station Website

- Tabular and graphical data available
- Website updated every 15 minutes
Weather Station Sensor Locations
Data Connection/Storage

• GPS/ATS Receivers
  – Uses wireless technology
  – Differential base station at north rest area

• Weather Station
  – Uses cellular modem technology

• ITS Upgrade
  – Fiber optic hardwired to bridge and dedicated cabinets with filtered power for GPS/weather station
Structural Health Monitoring (SHM)

Purposes and Goals:

• Design verification (with analytical model)
• Establish normal movement
• Extreme event monitoring
• Deterioration/settlement detection
Design Verification

– Theoretical estimation of time-dependent stay forces to compare with empirical test results
– Calibration/verification of GPS readings
Analytical Model

- Time-dependent frame analysis model
- MIDAS Civil software used
- Main model P6S (106) to P6N (117)
Normal Operating Parameters

![Graph showing Normal Operating Parameters](image)

Updated: 30/03/09 15:25:38 (UTC-4:0)
Extreme Event Monitoring

• Hurricane effects
• Ship Impact
• Other Impacts
Future Goals

• Calibrated analytical model
• Additional sensors
  – Strain measurements
  – Stay vibration measurements
  – Thermal measurements
Any Questions?