_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

Site information:

Site Name: Troutdale Headend	Address:	
Division Contact Ian Campbell	Phone number 720-268-8877	SOW Approver: John Lavin
Region Contact Paul Stellmacher	Phone Number 971-338-3713	SOW Approver:

IAN

EPS

ALPHA

ALL

IAN&EPS

Table of Contents

Site information: 1

Overview: 3

Revisions: 3

Generic Steps: 3

General Scope of work: 4

Scope of work specifications 5

Design & Permitting: 5

Architect Scope of Services 5

_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

Architectural SOW 7

AC electrical upgrades: 8

SOW 9

Generator installations: 9

SOW 9

Exterior/Interior ground upgrades: 9

SOW 10

DC power Upgrade: 10

SOW 10

HVAC Upgrade: 11

SOW 11

Proposed Equipment ..... **Error! Bookmark not defined.**

Field Scope of work ..... **Error! Bookmark not defined.**

Fire Suppression: 12

SOW 12

Environmental Monitoring: 12

SOW 12

Security/Fire Alarms: 12

SOW 12

Infrastructure: 13

SOW 13

UPS: 13

SOW 13

_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

Timeline for Implementation:..... 13

General Product Information:..... 13

Overview:

1. New Electric Service and 400 sf +- bldg..
2. New Generators
3. New HVAC at new addition and rework at existing bldg..
4. Architectural desing for new 7500 SQFT technical space.
~~4.~~5. New fire suppression system at new addition and existing DC room.

Revisions:

Version #2 ~~-~~3/21/14

Generic Steps:

1. Attend Kick-off meeting with Comcast
2. Provide full time in-house project management on-site at all times for critical facilities.
3. Provide full time, qualified, trained, and experienced Lead Installer on-site at ALL times
4. All installation personnel on-site shall be qualified and experienced working in and around high value sensitive equipment, and have full understanding of all items listed below
5. During first day of installation: project management, lead and all installers along with pertinent Comcast personnel shall discuss all rules and regulations required for safe installation not limited to:
    a. Security of site, parking, gates, and door access
    b. Identification of all safety hazards
    c. Delivery requirements
    d. Working hours
    e. Protection required for floors
    f. Protection required for working equipment during delivery
    g. Protection required for performing SOW around in-service equipment
    h. Special considerations required for work in DC power room and in-service electrical panels
    i. Special considerations required for working with and protecting unfused cables
    j. Special considerations required for working with, protecting, storing and installing batteries.
    k. Use of electro-shield, Masonite, and flame retardant plywood for protection of exposed -48v busswork, batteries, equipment
    l. Proper protection procedures for working inside in-service equipment
    m. Special considerations for protection when working inside in-service BDCBB or DC plant
    n. Requirements for cable end protection for all cables as they are installed
    o. Instruction and training for 'booting' of hot conductors
    p. Fire suppression systems & fire alarm systems are required to be taken off line while any drilling, heat shrinking, brazing, or cutting work is in progress. All alarm systems shall be restored at the end of each working period.
    q. All contractors must maintain dust free environment during all phases of construction while working in critical facilities. Clean room practices must be adhered to at all times. Install & hang (ASFR) poly sheeting between work area & headend room area. HEPA vacuums or

HEPA-vac air filtration system shall be used during all phases of demolition saw cutting, construction, sanding, or painting to maintain dust free environment.

r. Safe use of ladders
s. Requirements for commercially insulated tools in AC electrical gear and DC power room
t. Requirements for properly protected tools for use anywhere in the facility
u. Requirements for arc flash suits
v. Safe storage of tools, equipment, cable rack, aux bar, etc during the entire duration of the installation
w. Proper procedure and identification of area for cutting of steel outside of working equipment areas
x. Understanding of lock out-tag out procedures
y. Basic understanding of the fire suppression system employed, location of abort stations and instructions for procedures to be followed for any real or false event
z. Use of caution tape and cones to warn personnel of specific hazards
aa. All installers signing a provided checklist of all items listed above verifying their understanding of all items, and of generally accepted good workmanship and safety practices, OSHA regulations, Lock-out/tag out procedures, etc.
~~aa.~~bb. Must Carry Builder's All-Risk property insurance.

6. Lead installer shall conduct 'safety talks' with all installation personnel on site every day to discuss specific safety hazards and to discuss the plan and procedures to be followed for work steps involved. Weekly, or as needed, review of signed checklist items.
~~6.~~7. The building addition will require a substantial temporary access driveway from Halsey Street and temporary permits from Multnomah County. The temporary driveway will require replacement of landscaping, irrigation public sidewalk, benches and ornamental light fixtures.

General Scope of work:

1. All pertinent direction provided in the battery manufacturers install manual shall be followed.
2. No-ox and Scotch Brite shall be used for all connections. Use of No-Ox for all connections must be visible during audit inspection
3. Additional generic specification steps may be provided detailing proper workmanship requirements prior to kick-off.
4. Winning Vendor shall provide all necessary MOPS detailing work required
5. Vendor to provide all building or trade permit documentation, as-built drawings, one-line diagrams, & all close-out documentations to be included at completion of all projects.
6. Proper drawing and documentation shall be provided for all work involved, not limited to:
    a. Test Records for all work completed
    b. Cable running lists
    c. Specifications
    d. Product Information
    e. Battery test records provide to Comcast and battery manufacturer
    f. BDFB wiring list if applicable
    g. AC and DC plant wiring lists
    h. DC plant controller backup provided via email and copy left on site
7. Only mfg. certified representatives shall perform the startup and commissioning of all newly installed electrical equipment (UPS, inverter, DC power systems, generators, ATS's, etc.).
    a. Exception: This requirement is waived if the contractor has received certified training & is authorized by vendor.
8. All work performed shall adhere to all Comcast standards

9. Any deviation in equipment, materials or installation design from the original project scope of work MUST be authorized by the Comcast project manager.

Scope of work specifications

Design & Permitting:

1. Design, engineer, and provide stamped construction documents.
2. Provide all construction permitting
3. Provide all environmental permitting for new generator(s)
4. Attend and present at planning and zoning hearings as required to secure necessary approvals and permits

All Pre-cast building or any type of building installations, building additions & building renovations must adhere to the following permitting and engineering process:

Architect Scope of Services

1. Coordinate with general contractor to establish project budget estimate / verification of programmatic requirements (Comcast) and estimate all project elements
    a. Drawings: Detailed engineering drawings as needed to provided all items in this Scope of Work. Drawings will be stamped by a professional engineer registered in the state of building placement.

2. Pre-zoning documentation
    a. Document Existing Conditions
    b. Field verification of existing building conditions
    c. Prepare drawings necessary to inform municipal Planning and Zoning Commission and town planner of Site plan modification and building improvements.

3. Code Review
    a. Review owner supplied building program requirements
    b. Prepare schematic design- floor plans
    c. Prepare building code review
    d. Meet and review with local building inspector and fire Marshall
    e. Prepare floor plan illustrating all code requirements

4. Preliminary Zoning Review
    a. Meet with town staff and review preliminary architectural site plan, building plans and proposed elevations.
    b. Update preliminary design documents to reflect staff review comments.
    c. Meet with civil engineer, and other zoning consultants to review.

5. Architect
    a. Prepare architectural documents for Zoning Commission review

6. Civil Engineer
    a. Prepare demolition plan
    b. Prepare site plan
    c. Prepare grading and drainage plan
    d. Prepare utilities plan
    e. Prepare site lighting plan.
7. Landscape architect
    a. Prepare Site Planting Plan (If required)

8. Zoning Document Filing and review process to approval
    a. Determine and file required documents with Municipality.
    b. Prepare required documents.
    ~~b.~~c. Track process through jurisdiction.
    ~~c.~~d. Attend and present at public hearings.

9. Construction Document Services
    a. Architect
        1) Update zoning documents to reflect zoning approval comments
        2) Prepare construction details for architectural components
        3) Prepare construction cost estimate for verification of budget
        4) Procure building permit

    b. Landscape architect
        1) Prepare planting plan as required by site or as to meet Town requirements.

    c. Structural Engineer
        1) Prepare structural review of foundation, framing plans and details of
        2) Architectural construction documents
        3) Review specifications for appropriate divisions
        4) Certify plans as required by building permit review.

    d. MEP Engineering services
        1) Prepare HVAC, electrical plans and details
        2) Prepare specifications for Divisions 15 & 16
        3) Certify plans as required by building permit review.

    e. Fire Protection – Sprinkler Engineer
        1) Prepare sprinkler and alarm plans and details
        2) Prepare specifications for proposed work.

    f. Construction Administration
        1) On-Site Supervision by general contractor: Manage field activities, coordination of trades and quality assurance.
        ~~1)~~2) Architect to provide: shop drawing review; phone clarifications; code required field observations; punch list; attend construction meetings when requested by general contractor for agenda specific items.

_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

~~2)~~3)

Architectural SOW

1. Provide details for new cast-in-place steel reinforced concrete foundation pad for HVAC and Generators, transformers & utility transformer. Storm drainage with oil-water separator, if required
2. Provide details for concrete filled steel bollards every 5' around equipment perimeter of generator along parking area.
3. Provide details for concrete transformer vault per utility company requirements.
4. Provide all cutting, patching, trenching, concrete duct banks, backfill, and site restoration to original conditions for primary utility, secondary service, generator and HVAC conduits.
5. Provide stamped architectural drawings
6. Interior architectural improvements, per Comcast Standard (Any adjustments for site specific conditions must be approved by Division Ppower Director) for the following:
    a. Ground Penetrating Radar scan of exisiting concrete floor with engineering assessment for battery location and Headend area.
7. Exterior architectural improvements storage, per Comcast Standard for the following:
    a. Design and construct a 9525 square foot tilt wall building on existing poured pad adjacent to building. The 2002 design was for 9,525 square foot structure. Not following the original footprint will bring up the need for cutting and removing existing concrete slab for new footings in the correct location to reduce the footprint. I assume this is being done to create outdoor space for HVAC units but these units will probably need to have a tall screen wall which looks like a building wall to keep the City of Troutdale happy. Also, installing going back to the original tilt-up design may need to be considered carefully as there are many places on the existing slab where footings and other recesses where cast over with concrete with no rebar and plywood below. The plywood has been there for 14 years below grade and it's condition is unknown. Putting large crane on this slab and picking a heavy load with lots of boom will create heavy loads on the outriggers. All of these voids will need to be found and plated over if a crane outrigger is to be located on or near it.. Must match current exterior and design of existing building. Must meet Comcast standards for height and fire rating.
    b. Poured pad must be properly dried and inspected to mitigate any buckling of concrete. The slab has 12 years of moss and growing on it and it will need to also be thoroughly cleaned. The main issue could be curling since this was indoor (non-air entrained) concrete left in the weather for many years. Putting a roof over it and removing surface water could result in edge curling. A elevation monitor program should be set-up and monitored at the beginning of construction and after the building is enclosed.
    c. Design opening for new 48" wide double door on exterior wall of existing battery room to connect new structure. Sawcut and remove existing concrete wall. Provide and install new pair of 48"x96" hollow metal door and frame with necessary commercial grade door hardware. Seal the opening perimeter and repair finishes as required. A 96"x96" opening will probably require the existing panels to be reinforced around the opening.
    d. Design opening for new 48" wide double door on exterior wall of existing Headend room to connect new structure. Sawcut and remove existing concrete wall. Provide and install new pair of 48"x96" hollow metal door and frame with necessary commercial grade door hardware. Seal the opening perimeter and repair finishes as required. A 96"x96" opening will probably require the existing panels to be reinforced around the opening.

e. Design opening for new 48" wide double door on exterior wall of new Headend room to connect new new sidewalk on front of building. Sawcut and remove existing concrete wall. Provide and install new pair of 48"x96" hollow metal door and frame with necessary commercial grade door hardware. Seal the opening perimeter and repair finishes as required. A 96"x96" opening will probably require the existing panels to be reinforced around the opening.

8. Exterior architectural improvements new electrical room, per Comcast Standard for the following:
   a. Design and construct a 400 square foot electrical room to house all new primary electrical service (MTG, GTG) . Must match current exterior and design of existing building.
9.
10. Patching and Painting
11. Design, fabricate and install a new galvanized steel catwalk for access to service doors on both generators.The intent of this landings, stairs, guardrails and handrails at each service door.
12. General Contractor to carry a $100,000 Allowance for latent conditions, to be used with sole discretion of Comcast.
    How many satellite dishes and foundations need to be removed and backfilled--- (Four)? This would include SAT coax, AC power, bonding and natural gas piping including rerouting these services to remaining dishes depending upon the ones being removed. Which dishes are to be removed --- Dish number: 9,10,13 and 14), which can be abandoned in place--- Dish # 11,12,15,and 16, which need to be relocated---#5 search dish to position #8 and which ones need to be refed --- zero. There is a site plan available with numbers--- yes attached with bid request package.
13. Repair other site work finishes which will be affected. Sidewalks, asphalt paving, striping, concrete curbs, gravel surfacing, striping, landscaping, irrigation, possibly gate power and controls.
~~12.~~14. Accomodate all landscaping and irrigation requirements to meet the City of Troutdale's requirements.
~~13.~~15. All exterior walls and ceilings must meet a 2 hour fire rating per Comcast standards.
~~14.~~16. Roofing shall be BUR membrane.
~~15.~~17. All insulation shall meet the present Oregon Energy Efficiency Specailty Code.
~~16.~~18. All finished floor shall be 1/8 VCT with anit-static wax finish. All floor to wall base molding shall be 4" rubber base.

AC electrical upgrades:

All electrical panels feeding DC power system rectifiers must be sized and calculated using the total FLA (full load amperage) rating of each rectifier being fed from the panel. The following calculation shall be used:

Rectifier FLA (X) Total # of rectifiers (X) 125% (continuous load) = Calculated load

Panel rating (X) 80% = Maximum load to be put on the panel.

Example: Maximum load to be put on a 225 Ampere rated panel.

225 A. X .8 = 180 Amperes is the maximum load to be put on this panel.

_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

SOW

1. Carry a $55,000 allowance for local utility company charges to provide a new ~~1200A~~1600A 277/480V electric service via a new pad mounted transformer located per drawings.
2. Once PO is issued, vendor to supply payment to utility company and coordinate service upgrade
3. Supply and install primary electrical conduits from property line to new transformer location.
4. Provide and install 1200A 277/480V 3PH 4W electrical service to the building.
5. Provide and install step down transformers for for convenience power and existing 120/208V Load to remain
6. Provide and install a 150KVA K13 rated transformers for critical 120/208V loads
7. Provide and install a new 1600A UTG and GTG ATS (interior). Switches shall be Isolation Bypass type and rated specifically for the application.
8. Backfeed existing 600A distribution panel 277/480V EP .
9. Provide electrical demolition as required for power, lighting, generator and service equipment.
10. Provide temporary feeders as necessary to properly sequence work and avoid power interruptions
11. Provide (75) new 277 VAC 2 tube overhead lighting with shattershield lamps in the following areas: new power room, new Headend area, any retrofitted area.
12. Add AC distribution to rectifiers. 225 amp 3 phase 480 vac to A2 and B2
~~12.~~13. Surge Protection Devices (SPD) and alarms. Install on all 3 sources.
~~13.~~14.

Generator installations:

1. Provide diesel fuel delivery to fill fuel tank to 100% full. Diesel fuel shall be treated with winterized additive.
2. All new generator installations shall meet all the requirements per Article 7.13 / NFPA 110 Standard for Emergency & Standby Power Systems. A complete system Commission and on-site acceptance testing of generator and associated electrical switch gear. Vendor to provide all test reports and documentation.

SOW

3. Provide and install (2) new 1000KW 277/480V Caterpillar or Cummins diesel generator
   a. 1500 Gallon UL142 sub-base fuel tank
   b. Full tank of diesel fuel. Fill to 90% before and after commissioning. B10 diesel which is the only type of diesel available in Oregon.
   c. Arcadis permitting per Comcast Corporate standards
   d. Level I sound housing Check with local AHJ for sound level needed at site.

e. Ancillary circuits for block heater, battery charge and start Remote E-stop.
f. Each generator provided (2) 1600A circuit breaker (one for load bank)
g. Alarms relays for interface with Comcast XOC
~~f.~~h. Tanks piped together to be able to transfer fuel if one generator is out of service on long commercial power outage with weather restricted access to additional fuel.
~~g.~~i. Extension of normal main tank vents, emergency main tank vent and emergency interstitial vent to 12 feet above finish grade.
~~h.~~j.

2. Provide and install feeders in conduit to new GTG ATS.
3. Remove, recycle or properly dispose of fuel in existing generators tanks
~~3.~~4. Provide documentation to Comcast of disposal.
~~4.~~5. Remove and sell or scrap existing generators and provide documentation to Comcast
~~5.~~6. Seismic certification from factory required.

Exterior/Interior ground upgrades:

All ground wire connections shall be crimped with "H" taps and crimped in a directional ground fault flow manner.

SOW

1. Bond new electrical and HVAC equipment to existing ground ring.
2. Provide a new NEC Code required service ground
3. Provide and new MGB and AGB in new eternal power room
4. Provide a new AGB in new Head End
5. Connect existing exterior ground ring to new MGB
6. Connect existing MGB to new MGB and disconnect existing MGB from exterior ground ring.
7. All new Interior DC equipment, cabinets, batteries, etc. to be bonded in accordance with Comcast Standards.
8. Bond MGB to building steel and water pipe with #4/0 green RHH cable.
~~8.~~9.

DC power Upgrade:

All new battery strings must be accompanied with a 10 year full warranty and supporting documentation from the mfg. Only C&D & Deka Unigy (Gulfstream) battery suppliers currently have such agreements in place.

SOW

1. Strap existing DC A and B plant to make a single plant

2. Provide approximately 100LF of GE 10,000A overhead +/- DC Collector bus.
    a. Provide factory engineered custom bus from power bays
    b. Provide (12) 1200A battery connection points with shunt monitoring
    c. Allow for expansion of bus within DC power room for future power bays
    d. Make provisions for (12) 600A bus fuse positions for future distribution on main floor.
    e. Make provisions for (8) 600A bus fuse positions in power room for inverter.
    f. Make provisions for (24) 600A bus fuse positions on main floor for BDCBB distribution.
    g. Supply and install (2) new 1600A battery strings with disconnects at a two hour rate.
3. Add 3600 supplemental bays at end of recitifier bays.
4. Add 8000 amp main term bar
5. Shunts at controller to slave master
6. Relocate transformer to allow room for inverter
7. Provide and install (4) Six Panel BDCBB's, each with 6-600 amp loads.
8. Provide and install (20) GMT 100A FAPS.
9. Provide and install (10) KTK 100A FAPS.
10. Provide and install the following diverse DC circuits for direct fed equipment and FAPS:
11. Wiring from FAP to electronics by Comcast.

HVAC Upgrade:

SOW

1. Supply and install (5) exterior Liebert or Aaon Precision Air Systems 30 ton Glycol split systems. Upflow, ducted overhead supply, iCom or like Controller, w/ humidification and infared thermal, Front return and access. Intergrated condensate pump and moisture detection. 460v 3 phase
2. Headend: Supply and install full ducted air distribution supply/return system overhead creating a hot/cold aisle configuration for new Headend area. All supply registers shall have adjustable diffusers.
3. All piping shall be insulated, wrapped in white vinyl interior, fully jacketed aluminum covering with proper straps including bends on exterior, labeled every 10' for flow direction and identification of pipe use.
4. All exterior supports and hardware shall be stainless steel and permanently mounted to walls of slab
5. Remove all existing water pipes in DC room feeding existing HVAC
6. Rework office HVAC to accommodate comfort cooling.
7. Remove and decommission all exising HVAC feeding Headend
~~7.~~8. Are all new units to be factory seismically certified.
~~8.~~9. Patch and repair all structure and finish surfaces where mechanical equipment and related systems components are added or removed.

Fire Suppression:

Fire Suppression systems to be designed by a qualified licensed engineer and be designed to meet all requirements of the NFPA 2001 specifications. Commissioning testing must include & pass room integrity "fan" test. Municipal or local fire department to witness test.

SOW

1. Design, supply and install full Clean Agent Fire Suppression for expanded Headend,DC Power Room and new AC Power Room?.
2. All alarms should report to the Comcast XOC interface via spectrum.

Environmental Monitoring:

Vendor shall provide test records that detail all points wired and tested for Proper Operation

SOW

1. Expand existing monitoring system for all new and existing Comcast required alarm points. Vendor is responsible to install any missing telemetry points within the existing environmental systems as well as add the required new ones.
2. Vendor is responsible for all turnup control boards, tie into Spectrum and final testing all the way through to the XOC. Will Comcast handle all tie-ins on the transport side of the Quest Controls demarc panel.

Security/Fire Alarms:

All security installations must adhere to Comcast Corp. Security Installation Standards.

SOW

1. Provide badge access for all new doors. Wire to existing badge access system.
2. Provide all necessary exit signs, horn/light strobes, pull stations, fire extinguishers and clean agent in equipment areas, emergency lighting and, smoke detectors for new and existing areas that are required by NFPA, local municipality and Comcast standards.

_____HIGH LEVEL SCOPE OF WORK_____

DOCUMENT # TROUTDALE, OREGON EXTERIOR EXPANSION

VERSION 01 DATE: ~~FEBRUARY 25TH~~ ~~MARCH 21~~ APRIL 9TH, 2014

Infrastructure:

SOW

1. Supply and install 500 lf (1500 lf total) of gold chromate ladder 3 tier in new Headend and battery room. Provide gold chromate stanchions where required.
2. Supply and install 250 lf of fiber management, manufacturer per Comcast Regional Mangement.
3. Suppyl and install 30 express exits for fiber management
4. Provide and install (~~10 only 10~~ 60?) (36" deep / New Comcast equipment rack w/ cable management package spec., ~~30"~~22 5/8W x ~~45RU~~ 48RU x ~~36.88~~ 36"D, Black) equipment cabinets in headend room bolted to the floor.
5. Provide and install (10 only 10?) (48" deep / New Comcast equipment rack w/ cable management package spec., ~~30"~~22 5/8W x ~~45~~ 48RU x 48"D, Black) equipment cabinets in headend room bolted to the floor.
~~5.~~6. Supply install 30 relay frame racks 45RU x 19"
7. . .
~~6.~~8. Does there need to be conduit connections or cable slot between the Building Addition and new Head-End to facilitate the cut-over? Two locations, upsize fiber vaults (7' x12' X 8' tall), Sixteen 4" schedule 40 conduits. Diverse vaults/paths stub up main hub floor east west walls

UPS:

SOW

1. Not in Contract.

Telecommunications & RF Cabling:

2. Not in contract, Comcast to perform with own forces.

Timeline for Implementation:

Need quotes by 11/1/13, ~~New Date?~~ April 28, 2014 12 noon

General Product Information:

1. Caterpillar/Cummins Generator
2. Interior Mounted Bypass Isolation ATS
3. GE/Lineage/ Alpha DC plants and Bus
4. East Penn or C&D batteries
5. EMCOR Racks
6. Quest Controls or RLE Monitoring system with Demarc alarm box