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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | |
| **TBE FOR EMERGENCY DIESEL GENERATOR**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | |
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| D00 | Nov. 2024 | IFI | M.Pourdasht | M.Fakharian | M.Sadeghian |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **Client Approval** |
| **Class: 3** | | **Client Doc. Number:** **F0Z-709334** | | | | |
| **Status:** | **IDC: Inter-Discipline Check**  **IFC: Issued For Comment**  **IFA: Issued For Approval**  **AFD: Approved For Design**  **AFC: Approved For Construction**  **AFP: Approved For Purchase**  **AFQ: Approved For Quotation**  **IFI: Issued For Information**  **AB-R: As-Built for Client Review**  **AB-A: As-Built –Approved** | | | | | |

**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |  | **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |
| **1** | X |  |  |  |  | **51** |  |  |  |  |  |
| **2** | X |  |  |  |  | **52** |  |  |  |  |  |
| **3** | X |  |  |  |  | **53** |  |  |  |  |  |
| **4** | X |  |  |  |  | **54** |  |  |  |  |  |
| **5** | X |  |  |  |  | **55** |  |  |  |  |  |
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| **7** | X |  |  |  |  | **57** |  |  |  |  |  |
| **8** | X |  |  |  |  | **58** |  |  |  |  |  |
| **9** | X |  |  |  |  | **59** |  |  |  |  |  |
| **10** | X |  |  |  |  | **60** |  |  |  |  |  |
| **11** | X |  |  |  |  | **61** |  |  |  |  |  |
| **12** | X |  |  |  |  | **62** |  |  |  |  |  |
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| **TBE For Emergency Diesel Generator** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **MR** | **PMR For Emergency Diesel Generator**  **(** **BK-GCS-PEDCO-120-EL-MR-0004 )** | **Purchaser Requirement** | **Mah Niroo** | **Status** | **Sazand** | **Status** | **Hadid Sanat Pars Niroo** | **Status** |
| **Item** | **Description** |
| 1. **Environmental Data (Process Basis Design, BK-GNRAL-PEDCO-000-PR-DB-0001)** | | | | | | | | |
|  | Location | Binak Oilfield in Bushehr Province | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Installation | Outdoor Under Shelter, Safe Area | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Installation Elevation | 12.5m (Above Sea Level) | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Seismic Loads | Zone 3 UBC | Confirmed | A | As Manufacturer Standard | A | Confirmed | A |
|  | Relative Humidity | 100% | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Ambient Temperature Range | 5 ~ 52°C | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Atmosphere | Corrosive & Hot | Confirmed | A | Confirmed | A | Confirmed | A |
| 1. **General** | | | | | | | | |
|  | Manufacturer's Name | By Vendor | Mah Niroo | A | Sazand Eng co. | A | Volvo | A |
|  | Model | By Vendor | - | C | Volvo + Stamford | A | TAD1641GE | A |
|  | Quantity/Tag Number | 1 /GCS-DG-001 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Electrical Standard | IPS-E-EL-100(1)  IPS-M-EL-138 (1)  BK-GNRAL-PEDCO-000-EL-SP-0009 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Mechanical Standard | IPS-M-PM-290 (2)  BK-GCS-PEDCO-120-ME-SP-0012 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | References | Calculation Note for Diesel Generator Sizing  (BK-GCS-PEDCO-120-EL-CN-0007) | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Description of Equipment | Gen Set with Diesel Engine Prime Mover (Diesel Generator) | Confirmed | A | Confirmed | A | Confirmed | A |
| 1. **Engine Specifications** | | | | | | | | |
|  | Genset Operation Mode (Single or Parallel) | Single | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Duty | Emergency Standby  (Calculated for continuous operation) | Confirmed | A | Confirmed | A | Standby Duty | A |
|  | Aspiration | Turbo Charged, Intercooler | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Cylinder configuration | By Vendor | In Line | A | In Line | A | In Line | A |
|  | Number of Cylinders | By Vendor | 6 | A | 6 | A | 6 | A |
|  | Type | Industrial, 4 strAes, Direct Injection | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Displacement (liter) | By Vendor | 16.12 | A | 16.12 | A | 16.12 | A |
|  | Bore/StrAe (mm) | By Vendor | 144/165 | A | 144/165 | A | Later | C |
|  | Compression Ratio | By Vendor | 16.5:1 | A | 16.8:1 | A | Later | C |
|  | Governor Type | Electronic | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Air Cleaner Type | Heavy Duty | Confirmed | A | Replaceable | N | Standard | N |
|  | Engine speed (rpm) | 1500 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Derating Factor for Working at Site Conditions (55°C) | 0.97  (Vendor Shall Advise This Value) | Confirmed | A | Engine : No Deration  Alternator :90% | N | Later | C |
|  | ISO Gross Shaft Power at (kw)  Continuous  Prime  Maximum Standby | By Vendor  >494  >506 | 465  Confirmed  Confirmed | A  A  A | 670  Confirmed  710 | A | 658 HP | A |
|  | Cooling Fan Power Requirement (kw) | 10 | Confirmed | A | 21 | A | Later | C |
|  | ISO Net Shaft Power at (kw)  Continuous  Prime  Maximum Standby | By Vendor  >496  >510 | 440  Confirmed  Confirmed | A  A  A | Confirmed | A | 440 KW | A |
|  | Piston Speed (m/s) | By Vendor | 8.3 | A | 8.3 | A | Later | C |
|  | Starting System | Electrical | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Type of Batteries | Vented Ni-Cd | Confirmed | A | Confirmed | A | Lead Acid | N |
|  | Number of Batteries (Cell) | 20 Number Cells | Confirmed | A | Confirmed | A | NO | N |
|  | Size of Batteries (Ah) | Not Less than 200 Ah | 190 KPH | A | Confirmed | A | 200 AH | A |
|  | Max Startup & Loading Time  up to Full Load (Sec) | 10 Sec | 15 Sec | A | Confirmed | A | Confirmed | A |
| 1. **Lubricating System** | | | | | | | | |
|  | Type | Forced Feed by Gear Oil Pump | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Total Oil Capacity Min/Max (liter) | By Vendor | 42 | A | 48 | A | Later | C |
|  | Oil Filter | By Vendor | Confirmed | A | Replaceable | A | Confirmed | A |
|  | Oil Cooler | Water Cooled | Confirmed | A | Confirmed | A | NO | N |
|  | Oil Type Required | By Vendor | 40W/15 | A | 10W/30 | A | 15W/40 | A |
|  | Lube Oil Consumption at: (gr/h)  Continuous Power  Prime Power  Standby POWER | By Vendor | Volvo Standard | A | Prime : 0.10 L/h  Stand By : 0.11 L/h | A | Later | C |
| 1. **Fuel System** | | | | | | | | |
|  | Type of Fuel | Gas oil | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Fuel Filter Type | By Vendor | Double | A | Replaceable | A | Later | C |
|  | Permissible Suction Head | By Vendor | Double | A | As Manufacturer Standard | A | Later | C |
|  | Permissible Return Head | By Vendor | Volvo Standard | A | As Manufacturer Standard | A | Later | C |
|  | Specified Fuel Consumption at: (gr/kwh)  100% Maximum Standby Power  Prime Power  100% Continuous Power | By Vendor | 127 L/H IN 100% LOAD 115 L/H IN 100% LOAD 110 L/H IN 100% LOAD | A | Prime : 191 gr/Kwh  Stand By : 193 gr/Kwh | A | 90 L/H @ 75% | A |
|  | Daily Tank | For 8 Hours Operation | Confirmed | A | Confirmed | A | Confirmed | A |
| 1. **Cooling System** | | | | | | | | |
|  | Total Coolant Capacity (liter) | By Vendor | 60 | A | 50 | A | Later | C |
|  | Water Pump Type | Centrifugal | Confirmed | A | Confirmed | A | Later | C |
|  | Temp. Rise Across Engine at: ºC  Continuous Power  Prime Power  Standby Power | By Vendor | Volvo Standard | A | As Manufacturer Standard | A | Later | C |
|  | Heat Rejection to Exhaust  (Prime Power) (kw) | By Vendor | - | C | 415 | A | Later | C |
|  | Heat Rejection to Coolant  (Prime Power) (kw) | By Vendor | - | C | 239 | A | Later | C |
|  | Heat Rejection to Intercooler  (Prime Power) (kw) | By Vendor | - | C | 131 | A | Later | C |
|  | Heat Rejection by Radiation From Engine Surface (Prime Power) (kw) | By Vendor | - | C | 23 | A | Later | C |
|  | Cooling Air Required for Radiator  (Prime Power) (kw) | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
| 1. **Air Intake** | | | | | | | | |
|  | Combustion Air Flow at: (m3/h)  Standby Power  Prime Power  Continuous Power | By Vendor | Volvo Standard | A | As Manufacturer Standard | A | Later | C |
|  | Max. Air Intake Restriction of Engine : hPa  With New Filter  With Used Filter | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
|  | Alternator Cooling Air (m3/h) | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
| 1. **Exhaust System** | | | | | | | | |
|  | Max. Allowable Back Pressure  for Exhaust Line (pa) | By Vendor | Volvo Standard | A | As Manufacturer Standard | A | Later | C |
|  | Exhaust Flow (at Standby Power) (m3/h) | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
|  | Exhaust Gas Temp. After Turbine  (at Standby Power) (ºC) | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
|  | Silencer Type | Residential | - | C | Industrial | N | Confirmed | A |
|  | Spark Arrester | Required | Confirmed | A | Confirmed | A | NO | N |
| 1. **Engine Auxiliaries** | | | | | | | | |
|  | Alternator Manufacturer | By Vendor | Volvo Standard | A | Stamford | A | Stamford / MEC ALTE | A |
|  | Alternator Voltage (v) | By Vendor | - | C | 400 | A | 400 | A |
|  | Alternator Current (A) | By Vendor | - | C | 1000 | A | 800 | A |
|  | Starter Manufacturer | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
|  | Starter Motor Voltage (v) | By Vendor | - | C | As Manufacturer Standard | A | 24 | A |
|  | Starter Motor Power (kw) | By Vendor | - | C | As Manufacturer Standard | A | Later | C |
| 1. **Generator Specifications** | | | | | | | | |
|  | Quantity / Duty | 1 X 100% / Continuous | Confirmed | A | Confirmed | A | Standby | N |
|  | Manufacturer / Type | By Vendor | Stamford/HCI544E | A | Stamford / S5L1D-F | A | Later | C |
|  | Continuous Rating (MCR) at Standard Condition for Class F Temperature Rise (kva) | > 512kVA to meet continuous operation  > 539kVA to meet starting conditions | Confirmed | A | Confirmed | A | 550 KVA Stanbay | N |
|  | De-Rating Factor for Ambient Temperature Kt | 0.9  (MFR shall advise his value) | Confirmed | A | 9% For Alternator | N | Later | C |
|  | De-Rating Factor for Altitude Ka | 1.0 | Confirmed | A | Confirmed | A | Later | C |
|  | Total Generator De-Rating Factor Kd=Ka\*Kt | 0.9  (MFR Shall Advise His Value) | Confirmed | A | 9% For Alternator | N | Later | C |
|  | Continuous Rating (MCR) at Site Conditions for Class F Temp. Rise (kva) | 394 | Confirmed | A | Confirmed | A | Class H | N |
|  | Permissible Overload  (Class H Temp. Rise & Standby Duty) (kva) | 10% of Rated Current for a Period of One Hour (in Each 12 Hours Function) | Confirmed | A | Confirmed | A | Not Allowed | N |
|  | Starting Capability  (12% Voltage Dip at gen. Terminal) | Starting of the biggest motor while having the other loads in operation PF=0.80 | Confirmed | A | As Manufacturer Standard | A | Later | C |
|  | Unbalance Loading Capacity (%) | 15% | Confirmed | A | As Manufacturer Standard | A | Not Specified | N |
|  | Power Factor | 0.80 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Terminal Voltage (v) | 400 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Stator Winding Connection | Series Star | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Frequency (Hz) | 50 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Grounding | Solidly Grounded | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Neutral Point | Brought out | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Insulation Class | F | Confirmed | A | H | N | H | N |
|  | Temp. Rise for Continuous Duty | B | Confirmed | A | Confirmed | A | H | N |
|  | Ingress Protection of Terminal Box | IP55W | Confirmed | A | IP55 | N | Confirmed | A |
|  | Ingress Protection for Generator | IP23 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Short Circuit Ratio  at Rated Volts & Current | By Vendor | refer to catalog | C | As Manufacturer Standard | A | Later | C |
|  | Synchronous Reactance Xd  (Base 600kVA, 400V, Saturated) (pu) | By Vendor | - | C | 2.62 | A | Later | C |
|  | Direct Axis Transient Reactance X’d1(pu) | By Vendor | - | C | 0.14 | A | Later | C |
|  | Direct Axis sub-Trans. Reactance X”d (pu) | By Vendor | - | C | 0.1 | A | Later | C |
|  | Quadrature Axis Reactance Xq (pu) | By Vendor | - | C | 2.19 | A | Later | C |
|  | Quadrature Axis Sub-Trans. Reactance X”q (pu) | By Vendor | - | C | 0.23 | A | Later | C |
|  | Zero Sequence Reactance X0 (pu) | By Vendor | - | C | 0.08 | A | Later | C |
|  | Negative Sequence Reactance X2 (pu) | By Vendor | - | C | 0.16 | A | Later | C |
|  | Leakage Reactance XL (pu) | By Vendor | - | C | 0.04 | A | Later | C |
|  | Time Constants (sec)  Td’  Td”  Ta | By Vendor | - | C | 0.08  0.012  0.019 | A | Later | C |
|  | Generator Efficiency at:  1/2 Full Load (%)  3/4 Full Load (%)  4/4 Full Load (%) | By Vendor | - | C | 95.4  95.5  95 | A | Later | C |
|  | Number of Bearings | 1 (2 is preferred) | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Type of Bearings / Lubrication | Anti-friction / Grease | Confirmed | A | Ball / Confirmed | A | Confirmed | A |
|  | Generator Space Heater  - Voltage (v)  - Power (w) | Required  230  By Vendor | Confirmed  Confirmed  500 W | A  A | Confirmed | A | Confirmed | A |
|  | Exciter Type | Self-Excited (PMG is preferred)  Brushless, 3 phase sensing | Confirmed | A | Self-Excited | A | Confirmed | A |
|  | Exciter Voltage | By Vendor | 80 | A | As Manufacturer Standard | A | Later | C |
|  | Exciter Manufacturer | By Vendor | Stamford | A | Stamford | A | Later | C |
|  | AVR Model | By Vendor | AS450 | A | AS440 | A | Later | C |
|  | Voltage Regulation | ±5% | Confirmed | A | ±1% | A | Later | C |
|  | Exciter Current at: (A)  Continuous Operation  Short time Overload | By Vendor | Stamford Standard | A | As Manufacturer Standard | A | Later | C |
| 1. **Control Panel** | | | | | | | | |
|  | Manufacturer | By Vendor | Mah niroo Ind | A | Sazand Eng Co. | A | Deep Sea | A |
|  | Standard | IEC, IPS-M-EL-143(3) | Stamford | A | As Manufacturer Standard | A | IEC | A |
|  | Type | Fixed | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Construction | Self-Standing | Confirmed | A | Confirmed | A | Skid Mounted | N |
|  | Sheet Steel Thickness | 2mm Wall / 2.5 mm Frame | Confirmed | A | Confirmed | A | Later | C |
|  | Access | Front Via Hinged Door | Confirmed | A | Confirmed | A | Skid Mounted | N |
|  | Location | Outdoor (Under Shelter) | Confirmed | A | Confirmed | A | Inside Canopy | N |
|  | Ingress Protection | IP54 | Confirmed | A | Confirmed | A | XX | C |
|  | Busbar System | 3Ph+N+PE | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Rated Busbar Current (A) | 800 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Busbar Material | Copper (Insulated With Heat Shrink) | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Protection Functions  (Embedded in ACB Protection Unit) | * Overload 49 * Phase over current 50/51   Earth fault 50N/51N | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Protection Functions  (Other Than ACB Protection Unit) | According to “BK-GCS-PEDCO-120-EL-SL-0002” | Confirmed | A | Confirmed | A | Please Send For Review |  |
|  | Controller Manufacturer / Model no. | By Vendor | Deep Sea 7320 | A | Deep Sea 7320 | A | Deep Sea | A |
|  | Indicators on Panel | * Gen. Voltages (Analogue) * Gen. Currents * Gen. Frequency (Analogue) * Battery charging ammeter * Power factor meter * Jacket water temperature * Lubricating oil temp. * Lubricating oil press. * Hours run meter * Watt meter * Watt-hour meter * VAR-hour meter   VAR meter | Confirmed | A | Confirmed | A | All In Controller Deep Sea | A |
|  | Transducers (4~20mA Output) | * Generator Voltage   Frequency | Confirmed | A | Confirmed | A | NO | N |
|  | Generator Neutral CT  Manufacturer  Rating & Class | Required for 51G protection  Required for 64R protection  By Vendor  51G: 800/5A, Cl. 5P10 | Confirmed  Confirmed | A  A | Confirmed | A | NO | N |
|  | Earth Fault Protections  Manufacturer  Type  Setting Range | Required  BY Vendor  Solid state  By Vendor | Confirmed  (BY DEEP SEA) | A | Confirmed | A | Later | C |
|  | Panel Accessories | Anti-Condensation Heater  Panel Lighting  Removable Gland Plate | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Finish Color | RAL 7032 | Confirmed | A | 7035 | A | Later | C |
|  | Cable entry | Bottom via Cable Gland | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Cable Specification & Size  From Generator to Local Panel:  From Local Panel to LV switchgear: | CU/XLPE/AWA/PVC  By Vendor  2x(1x300mm²) Phase 1  2x(1x300mm²) Phase 2  2x(1x300mm²) Phase 3  1x(1x3300mm²) Neutral | Confirmed | A | Later | C | Later | C |
| 1. **Switching Device** | | | | | | | | |
|  | Type of Switching Device | ACB | MCCB | N | Confirmed | A | MCB | N |
|  | Manufacturer | By Vendor | Schneider / Abb / Siemens | A | Schneider | A | Later | C |
|  | Type Designation | By Vendor | AFTER PO | A | As Manufacturer Standard | A | XX | N |
|  | Operating Mechanism | Motor Operated, Spring Charged,  Stored Energy, Trip Free Mechanism | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Number of Poles | 4 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Rated Current (A) | 800 | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Rated Voltage (V) | 690 | Confirmed | A | As Manufacturer Standard | A | Confirmed | A |
|  | Standard | IEC | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Rated Breaking Current | Not Less Than 35kA | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Charging Motor Operating Voltage (V) | 24 (Fed from diesel batteries) | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Trip Unit | Electronic type | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Trip Unit Functions | 49, 50, 51, 50N, 51N | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Trip Unit Model | By Vendor | Confirmed | A | As Manufacturer Standard | A | XX | N |
| 1. **Generator Accessories** | | | | | | | | |
|  | RTD (Pt100) | Yes (9 RTD’s for S > 500kVA) | (7 RTD) | N | 6 ( 2 Per Phase) | N | NO | N |
|  | Lifting Bolts | Yes | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Earthing Bolt | Yes | Confirmed | A | Confirmed | A | Confirmed | A |
|  | Drain Plug | Yes | Confirmed | A | Confirmed | A | Confirmed | A |
| 1. **General** | | | | | | | | |
|  | Noise Level | Not More than 81dB @ No Load | With Canopy Or Diesel Room Confirmed | N | @ 1m = 103.6 db | N | 85 db | N |
|  | Weight of Diesel Engine  Without Oil and Water (Kg) | By Vendor | 1550 Kg | A | Wet Weight : 1810 Kg | A | Later | C |
|  | Weight of Generator (Kg) | By Vendor | 1200 Kg | A | 1705 Kg | A | Later | C |
|  | Weight of Diesel Generator Skid (Kg) | By Vendor | 750 Kg | A | - | A | Later | C |
|  | Overall Dimension of Diesel Generator Skid (W x D x H) (mm) | By Vendor | 4000x1600x1750 | A | 3400 \* 1400 \* 2200 | A | Later | C |
|  | Dimension of Control Panel (W x D x H) (mm) | By Vendor | 600x800x300 | A | - | A | Later | C |

STATUS LEGENDS:

A=Acceptable

N=Not Acceptable

N/A=Not Applicable

INA=Information Not Available

C=Clarification is Required

CA= Conditionally Acceptable

M = Requirement is Mandatory

**Conclusion Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Equipment** | **Mah Niroo** | **Sazand** | **Hadid Sanat Pars Niroo** |
| **1** | **Diesel Generator** | Acceptable | Acceptable | Acceptable |